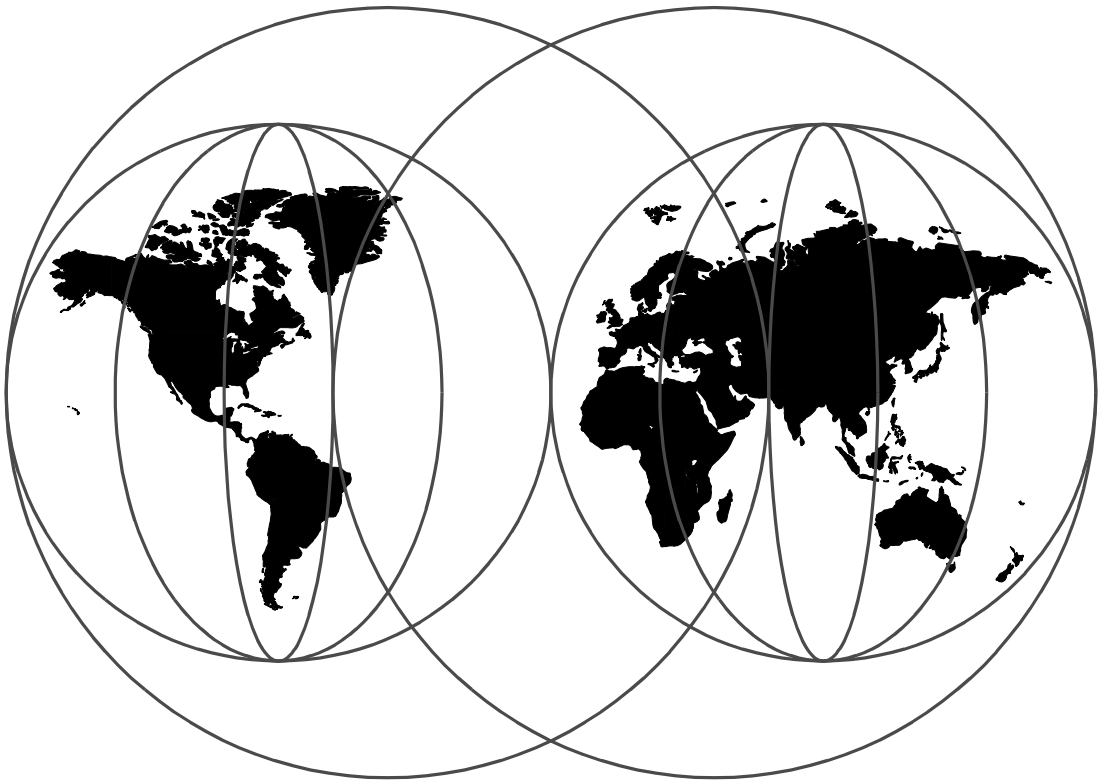
Optimizing IBM Netfinity Servers for SAP R/3 and Windows NT

Bill Sadek, Herman Kummler, Akash Saxena, Sandro Thierbach



International Technical Support Organization

http://www.redbooks.ibm.com

SG24-5219-00

International Technical Support Organization

SG24-5219-00

Optimizing IBM Netfinity Servers for SAP R/3 and Windows NT

November 1998

Take Note!

Before using this information and the product it supports, be sure to read the general information in Appendix E, “Special Notices” on page 151.

First Edition (November 1998)

This edition applies to SAP R/3, Release Number 3.1H and 3.1I of SAP R/3 for Windows NT, for use with the Microsoft Windows NT Server 4.0.

Comments may be addressed to:
IBM Corporation, International Technical Support Organization
Dept. HZ8 Building 678
P.O. Box 12195
Research Triangle Park, NC 27709-2195

When you send information to IBM, you grant IBM a non-exclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you.

© Copyright International Business Machines Corporation 1998. All rights reserved
Note to U.S Government Users - Documentation related to restricted rights - Use, duplication or disclosure is subject to restrictions set forth in GSA ADP Schedule Contract with IBM Corp.

Contents

Figures vii

Tables ix

Preface xi
The Team That Wrote This Redbook xi
0.1 Comments Welcome xii

Chapter 1. Introduction 1
1.1 Why Netfinity Servers? 1
1.1.1 Power, Performance and Scalability 1
1.1.2 Control and Manageability 5
1.1.3 Service 6
1.1.4 Implementation of High Availability 7
1.2 What is SAP R/3? 7
1.3 Why R/3 Applications Excel 8
1.4 The Openness of R/3 8
1.5 SAP Architecture 9
1.6 Client/Server R/3 Architecture 10
1.6.1 Database Layer 10
1.6.2 Application Layer 10
1.6.3 Presentation Layer 11
1.7 SAP Releases 11
1.8 High Availability 12
1.8.1 High Availability on the Hardware 12
1.8.2 High Availability on the Operating System 13
1.8.3 High Availability and SAP R/3 13
1.8.4 Clustering 14

Chapter 2. Configuring the Hardware and Installing Windows NT 17
2.1 Drivers and Updates 17
2.2 Uninterruptible Power Source Systems 18
2.2.1 UPS Product Range 19
2.2.2 UPS Sizing 20
2.2.3 Installing the APC UPS 21
2.3 IBM Netfinity 7000 Processor Upgrades 29
2.3.1 Processor Cache Sizes in SMP Environments 29
2.3.2 Installing the Processor Upgrade 30
2.4 RIBM Netfinity 7000 Memory Upgrade 33
2.4.1 Memory Configuration Rules 34
2.5 Installing Adapter Cards in the IBM Netfinity 7000 35
2.5.1 Performance Recommendations 36
2.5.2 Boot Order Netfinity 7000 37
2.5.3 Multiple ServeRAID Controller 38
2.5.4 Network Interfaces and SAP R/3 39
2.5.5 Redundant Network Interface Cards 40
2.6 Installing Internal Hard Drives in the IBM Netfinity 7000 41
2.7 Installing External Hard Drives in the EXP10 42
2.8 IBM Netfinity 7000 Video Subsystem 45
2.8.1 Additional Graphic Adapters 46
2.9 IBM Netfinity 7000 Power and Cooling 47

© Copyright IBM Corp. 1998

2.10 BIOS and Firmware Level 47
2.10.1 Netfinity 7000 System BIOS Update 47
2.10.2 ServeRAID BIOS and Firmware Update 49
2.10.3 Hard Disk Drive Update 50
2.11 Configurating the Advanced System Management Adapter 51
2.12 IBM Netfinity 7000 System Configuration Utility 53
2.12.1 SCU Settings for the ASMA Card 55
2.12.2 SCU Settings for the NT Installation 56
2.12.3 Configuration ServeRAID Adapter 58
2.12.4 Protecting the Netfinity 7000 67
2.13 Installing and Setting Up Your Windows NT 4.0 Server 68
2.13.1 Windows NT Installation 69
2.13.2 Install Windows NT 4.0 Service Pack 3 73
2.13.3 Install the Second Windows NT 73
2.13.4 Creating an Emergency Boot Disk 75
2.13.5 The ServeRAID Administration and Monitoring Utility 75
2.13.6 Preparing the Disk Space for the SAP R/3 installation 79
2.13.7 Tuning Windows NT Parameters for SAP R/3 81
2.13.8 Installing Windows NT Driver for the ASMA Card 85
2.13.9 Monitoring ServeRAID Adapter Events 86
2.13.10 Repair Disk Utility 87

Chapter 3. Installing the SAP R/3 Base System 89
3.1 System Configuration Overview 89
3.2 Customizing Windows NT 90
3.2.1 Define SAP Users 90
3.2.2 Change Permissions for Home Directory 91
3.2.3 Add Right to Log on As a Service 92
3.3 Installing Oracle 93
3.4 Installing SAP R/3 96
3.4.1 Installing a Central Instance 96
3.5 Creating the Database 98
3.5.1 Changing Defaults 99
3.5.2 Creating Oracle Database 99
3.6 Starting SAP R/3 102
3.7 Installing an Application Server 103
3.8 Post-installation Items 104

Chapter 4. IBM's Software Products that Complement SAP R/3 105
4.1 IBM's Commitment to Windows NT 105
4.2 IBM and Windows NT 5.0 105
4.3 Overview of IBM's Software that Complement SAP R/3 106
4.3.1 The UDB DB2 106
4.3.2 Visual Warehouse - the Datamart Builder for NT 106
4.3.3 Net.Data 106
4.3.4 DataPropagator Relational 106
4.3.5 IBM MQSeries 106
4.3.6 ADSTAR Distributed Storage Manager (ADSM) 107
4.3.7 Net.Commerce 107
4.3.8 IBM VisualAge 107
4.3.9 Lotus Domino 108
4.3.10 Lotus Notes 108
4.3.11 Tivoli Enterprise 108

4.3.12 eNetwork Communications Suite 108
4.3.13 eNetwork Host On-Demand 108
4.3.14 DataJoiner 109
4.3.15 IBM Flowmark 109
4.4 SAP R/3 Data Solutions using IBM ADSM 109
4.5 ADSM and SAP: A Powerful Combination 110
4.6 Flexible SAP R/3 Protection 110
4.7 SAP R/3 and Archiving 111

Chapter 5. SAP R/3's System Management 113
5.1 The Computing Center Management System (CCMS) 113
5.1.1 What's New in CCMS in SAP R/3 Release 4.0 113
5.1.2 Database and Archiving Management 114
5.2 Tivoli Enterprise Module for R/3 114
5.2.1 Managing Multiple Instances of R/3 114
5.2.2 Managing R/3 Application Servers and Database Servers 114
5.2.3 Client Installation and Configuration 115
5.2.4 Automation of SAP R/3 115
5.2.5 Introducing the Module Functions 116
5.2.6 Availability Management 116
5.2.7 TEC Event Adapter for the R/3 MIB 116
5.2.8 Monitor Collections 116
5.2.9 Tivoli Enterprise Console (TEC) 116
5.2.10 TEC Event Server Rule Base 117
5.3 IBM Netfinity Manager 118
5.3.1 The Netfinity Manager 118
5.3.2 The Client Services for Netfinity 119
5.3.3 Supported Platforms 119
5.3.4 IBM Netfinity Manager 5.x Functional Enhancements 120
5.3.5 Netfinity Manager Functions 121

Appendix A. Hardware and SAP R/3 Configurations Used for This Book 133

Appendix B. Certified IBM Netfinity Server Configurations 137

Appendix C. IBM Netfinity for Ready-to-Run R/3 139
C.1 Implementation Phases 139
C.2 Ease of implementation 139

Appendix D. SAP R/3 Sizing and Installation Planning 141
D.1 How to Access the Quick Sizer Tool 141
5.4 Installation Planning of Database for the SAP R/3 System 147
5.4.1 DB2 Database Server Installation Planning 147
5.4.2 Oracle Database Installation Planning 149

Appendix E. Special Notices 151

Appendix F. Related Publications 153
F.1 International Technical Support Organization Publications 153
F.2 Redbooks on CD-ROMs 153

How to Get ITSO Redbooks 155
How IBM Employees Can Get ITSO Redbooks 155
How Customers Can Get ITSO Redbooks 156
IBM Redbook Order Form 157

List of Abbreviations 159

Index 161

ITSO Redbook Evaluation 165

Figures

1. Bidirectional SSA Loop 4
2. SAP R/3 Modules 8
3. Layered Architecture of the R/3 System 9
4. Three-Tier R/3 Model 10
5. Example of a Clustered SAP R/3 Environment 14
6. System Board Netfinity 7000 31
7. Processor Card Netfinity 7000 32
8. Processor Card Jumper Block J1C1 33
9. Memory Card Netfinity 7000 35
10. Netfinity 7000 System Architecture 36
11. PCI Slots on the Netfinity 7000 System Board 37
12. Disable Extra Copies of ServeRAID BIOS 38
13. EXP10 Bay SCSI ID Assignments 43
14. Rear of the IBM Netfinity EXP10 Storage Expansion Unit 44
15. BIOS and Firmware ServeRAID Adapter 49
16. Main Menu ASMA Configuration Utility 52
17. View Service Processor Configuration 52
18. System Configuration Utility CD Boot Menu 54
19. System Configuration Utility Disk Boot Menu 54
20. System Configuration Utility Main Menu 54
21. SCU Add and Remove Boards 55
22. ASMA EISA Config File 56
23. BIOS Release and MP Level 56
24. APIC Settings 57
25. BOOT Options 57
26. System Management Options 57
27. ServeRAID Configuration Utility Main Menu 59
28. Initialize Configuration 60
29. Set SCSI Transfer Rate 61
30. Set BIOS Compatibility Mapping 62
31. Change RAID Parameters 63
32. Create Logical Drive 64
33. Changing the Write Policy of the Logical Drives 66
34. Back Up the ServeRAID Configuration 67
35. Logical Drive for the Second Window NT Installation 74
36. Example boot.ini File for Two Windows NT Installations 75
37. ServeRAID Administration and Monitoring Utility 76
38. Create a New Array and Logical Drive 77
39. Selecting Hard Drives for the New Array 77
40. Selecting RAID Level and Size of the New Logical Drive 78
41. Initialize Logical Drive 79
42. Windows NT 4.0 Disk Administrator 80
43. Format Partition 80
44. Forground Session Priority 82
45. Page File Size and Distribution 83
46. List of Windows NT Network Services 84
47. Server Service Tuning 85
48. Creating an Emergency Repair Disk 87
49. Create New User Window 90
50. Add User to Group Administrators 91

© Copyright IBM Corp. 1998

51. Assign Home Directory to <SAPSID>ADM 91
52. Change Permissions for Everyone 92
53. User Rights Policy 93
54. Add Log on As a Service Right to Sapservice<Sapsid> 93
55. Oracle Installation Language 94
56. Oracle Installation Settings 94
57. PATH Change for Oracle 94
58. Select Oracle Products to Install 95
59. End of Oracle Install 95
60. SAP SID Selection 96
61. Choose Type of SAP Server 97
62. Creating Central Instance 97
63. Central Instance Parameters 97
64. SAP Service Account 98
65. Assign Disk Drive Letters 98
66. Editing sapfs.inf 99
67. Local Drives 100
68. Database Installation Window 100
69. Database Install Options 100
70. Assign Disk Drive Letters 101
71. Copy Export CD 1 To Disk 101
72. Locate label.asc on CD 2 101
73. R3INST Log File 102
74. Locate File on Report Load CD 102
75. Starting SAP 103
76. SAP Service Account 103
77. Application Server Installation Log 104
78. Backup/Restore of SAP R/3 System using ADSM 111
79. The Tivoli Module for SAP R/3 115
80. A Typical Netfinity Manager Main Menu 122
81. Welcome to SAPNet 142
82. SAPNet Self Services 142
83. Quick Sizing 143
84. Start Quick Sizing (Registration) 144
85. Start Quick Sizing (Project Data) 144
86. Start Quick Sizing (Quantity-Structure-Dialog) 145
87. Start Quick Sizing (Quantity-Structure-Batch) 145
88. Quick Sizer Result 146
89. IBM SAP Alliance Web Sizing Request 146

Tables

1. Netfinity 7000 Bios and Driver Diskettes 18
2. On-Battery Run Time in Minutes 20
3. On-Battery Run Time for Selected Server Models 21
4. Command Line Parameters 26
5. Netfinity 7000 Processor Population Order 32
6. Some Acceptable Memory Configurations 35
7. Backplane Option Jumper Block (J10) 42
8. SCSI ID Settings on Jumper Block (J10) 42
9. Video Memory Upgrade for Older Netfinity 7000 System Boards 45
10. ServeRAID Arrays, Logical Drives and Operating System Partitions 134
11. SAP R/3 Disk Distribution 135

© Copyright IBM Corp. 1998

Preface

Netfinity servers have grown in processor power and storage capabilities at an exponential rate. This fact, coupled with high availability and clustering techniques, has led to increased sales in this market segment. Mission-critical applications such as SAP are increasingly being installed on this platform. Half of all new SAP licenses are on Windows NT.

This redbook will help you install, tailor and configure SAP R/3 on a Netfinity server. A sample installation is used to configure the hardware and software components on a step-by-step basis.

This redbook gives a broad understanding of the architecture of SAP R/3 on Windows NT and the IBM Netfinity Server platform. This will assist a specialist in understanding what elements should be considered in an SAP R/3 installation on Netfinity Servers.

The Team That Wrote This Redbook

This redbook was produced by a team of specialists from around the world working at the International Technical Support Organization, Raleigh Center.

Bill Sadek is an Advisory Specialist for SAP R/3 at the International Technical Support Organization, Raleigh Center. He writes extensively on SAP R/3 and Windows NT. Before joining the ITSO a year ago, Bill worked in IBM Global Services as an SAP R/3 Architect and SAP R/3 Sales and Distribution Consultant.

Herman Kummler is an Information Technology Specialist for the IBM ERP Competency Center in Philadelphia. He has been working with SAP since joining the competency center in 1996. He is a certified SAP R/3 basis consultant responsible for supporting customers running SAP R/3 and other ERP products on the IBM Netfinity platform.

Akash Saxena is a Technical Specialist for Netfinity Servers in Bangalore India. He has worked on Intel and HP-PA RISC platforms and has experience in Windows NT, NetWare, Windows 95 and SCO UNIX as well as HP-UX.

Sandro Thierbach is a System Engineer and PC Server specialist. He works for the IBM SWAT Team in Germany. He has been working in the IT sector for the past 11 years. He has 18 months of experience in supporting IBM PC Servers and IBM Netfinity Servers and their related network operating systems.

Thanks to the following people from the Systems Management and Networking ITSO Center, Raleigh for their invaluable contributions and guidance to the project:

Gail Christensen
Tim Kearby
David Watts
Rufus Credle
Shawn Walsh

© Copyright IBM Corp. 1998

Thanks to the following people for their invaluable contributions to this project:

David Laubscher, Netfinity Server Technical Support Services
Phil Horwitz
Martha Centeno
Mchael Riley
Marc Shelley

0.1 Comments Welcome

Your comments are important to us!

We want our redbooks to be as helpful as possible. Please send us your comments about this or other Redbook in one of the following ways:

- Fax the evaluation form found in “ITSO Redbook Evaluation” on page 165 to the fax number shown on the form.
- Use the electronic evaluation form found on the Redbooks Web sites:

  For Internet users `http://www.redbooks.ibm.com`
  For IBM Intranet users `http://w3.itso.ibm.com`

- Send us a note at the following address:

  `redbook@us.ibm.com`

Chapter 1. Introduction

This chapter covers in detail why you should proceed with IBM Netfinity Servers and discusses the Netfinity technology advantage and High Availability features. The chapter also discusses SAP, its architecture and various SAP releases.

1.1 Why Netfinity Servers?

The IBM Netfinity Server family is a new generation of enterprise systems that offers you power, scalability, control and service. Netfinity servers are based on industry-standard, Intel processor-based technology and are scalable-enhanced to save your hardware investments for the future. They are designed to provide high availability and excellent fault tolerance for business-critical applications such as SAP R/3 in the Intel-based server systems area. IBM is the only vendor in the world that can provide complete SAP R/3 solutions such as certified hardware, complementary products and SAP R/3 implementation services.

SAP R/3 on Windows NT and Intel-based systems is a growing market. Today's share of the market of the new SAP R/3 licenses on Windows NT-based servers is about 48 percent. This figure is still increasing dramatically.

IBM Netfinity Servers are particular optimized for the Windows NT operating system. At the IBM Kirkland Programming Center in Seattle, IBM professionals are working together with Microsoft development teams to test, certify, optimize and integrate the servers on the Windows NT platform.

IBM and the SAP AG are also partners. They signed an International Solutions Promotion Agreement in 1993, which covers mutual cooperation in development, sales and support of customer business solutions. They are working together to optimize SAP R/3, both with IBM and non-IBM products to support heterogeneous environments. IBM is committed to SAP R/3 with Windows NT.

IBM is the world leader in SAP R/3 application solutions on various platforms, including OS/390 on S/390 systems, OS/400 on AS/400 systems, AIX on RS/6000 systems and Windows NT on Intel-based server systems. It is even possible to combine NT-based application servers with an OS/390-based database server. This makes the systems highly flexible and scalable.

Especially in the SAP R/3 environment, you will need servers that are easy to administer and offer you many features to control and manage your servers, network and workstations. Netfinity servers are ready to fulfill all these tasks.

1.1.1 Power, Performance and Scalability

Integrated in all Netfinity Servers are the newest Intel Pentium II and Pentium Pro technology. Every server integrates symmetric multiprocessing (SMP) capabilities. All Netfinity servers have fault-tolerant error checking and correcting memory (ECC). The Netfinity 7000 is even capable of supporting up to four Pentium Pro processors and up to 4 GB of four-way interleaved ECC memory.

The redbook *IBM PC Server Technology and Selection Reference,* SG24-4760 describes server technologies and features such as SMP, ECC memory, interleaved memory and RAID systems.

© Copyright IBM Corp. 1998

1.1.1.1 Disk Space for SAP R/3

The SAP R/3 system is a data-intensive application with huge databases and demands unusually large amounts of disk storage. It transfers massive blocks of information so you will need a technology that is robust, reliable and scalable. You have a huge choice of internal and external hard disk subsystems for best performance and data reliability. The available solutions are divided into two different storage system interfaces that define the connection between a hard drive or storage subsystem and the computer.

1.1.1.2 SCSI Controller and Subsystems

A Small Computer Systems Interface (SCSI) controller has its own bus and set of instructions. There are several SCSI standards defined that differ in the used data transfer rate, the clock rate and the data path width on the SCSI bus. We talk only about SCSI-2 Fast/Wide and SCSI-2 Ultra Fast/Wide, because the Netfinity servers and the expansion enclosures are enabled either for one or both of these.

Up to 15 SCSI devices can be attached to a single SCSI-2 Fast/Wide or SCSI-2 Ultra Fast/Wide bus, which includes the SCSI controller as a SCSI device. One of the SCSI disadvantages is the bus arbitration, which means only two of those devices can communicate with each other at one time.

A problem of high clock rates on the SCSI bus is the possible cable length. With single-ended SCSI over long distances at a high clocking rate the signal can degrade and errors can occur. Differential SCSI was developed to solve this.

The bus length of SCSI-2 Ultra Fast/Wide is restricted to 1.5 meters. With differential SCSI, longer cable lengths can be maintained, up to 25 meters. IBM provided the differential SCSI solution: MetaStor RM/DS-20E from Symbios Logic, an external redundant array of independent disks (RAID) subsystem, which is connected to the server over a differential SCSI controller.

For more detailed information about SCSI and RAID technology see *Implementing PC ServeRAID SCSI and SSA RAID Disk Subsystems,* SG24-2098.

IBM offers Ultra Fast/Wide SCSI adapters and Ultra Fast/Wide SCSI RAID adapters to control and extend your internal disk space and hold your data. The RAID adapters provide high-performance hardware implementation of RAID-0, RAID-1, Advanced RAID-1 and RAID-5.

1.1.1.3 SCSI Solutions for SAP R/3

- SCSI Adapters
  - Two onboard Ultra Fast/Wide SCSI PCI Adapter in the Netfinity 7000
  - One onboard Ultra Fast/Wide SCSI PCI Adapter in the PC Server 325 and PC Server 330
  - IBM ServeRAID II three-channel Ultra SCSI RAID Adapter
  - Onboard IBM ServeRAID II one channel Ultra SCSI RAID Adapter in the PC Server 330

Note

For your SAP R/3 environment, we recommend you use only the RAID adapters to implement RAID technology with high-performance and data availability. The common SCSI adapters are very useful for connecting backup devices or for smaller test-and-development environments to build software RAID systems.

The supported maximum number of PC ServeRAID II SCSI Adapters you can use in any one server is five. As the ServeRAID Adapter is a full-sized PCI adapter, you can only use PCI slots that can accept full-sized adapters.

- External SCSI Enclosures
  - SCSI Multi-Storage Enclosure 3517 7-bay mini-tower enclosure (five half-high hot-swap bays)
  - PC Server Enterprise Expansion Enclosure 3518 22-bay tower enclosure (18 slim-line hot-swap bays)
  - PC Server Rack Storage Expansion Enclosure 3519 9-bay rack mounted enclosure (six slim-line hot-swap bays)
  - Netfinity EXP10 Storage Expansion Unit 3520 10-bay rack mounted enclosure (10 half-high hot-swap bays)
- Differential Solution
  - Symbios Logic MetaStor DS/RM-20E with the Symbios Logic PCI Ultra SCSI Differential Controller SYM8751D

Note: The Symbios Logic MetaStor DS/RM-20E is only supported with the Netfinity 7000 and the PC Server 704 for SAP R/3.

For detailed information on the range, please review *IBM PC Server Technology and Selection Guide,* SG24-4760.

1.1.1.4 SSA Controller and Subsystems

Serial Storage Architecture (SSA) is a high-performance serial industry-standard interface and is defined to connect devices to host adapters. It is specified through the open ANSI standard X3T10.1 and includes SCSI-2 commands, queuing model, status, and sense bytes. The current maximum transfer rate is 80 MBps and IBM is developing devices with transfer rates of 160 MBps.

SSA subsystems are typically built up by bidirectional loops of adapters and devices. SSA is a point-to-point serial link without the disadvantages of a bus system such as SCSI. Therefore, SSA does not use bus arbitration for communication. A dual-port SSA host allows four conversations. Bus architectures can have only a single conversation at the same time. Each port supports a 20 MBps read and a 20 MBps write. A dual-port adapter using full-duplex capability can have a bandwidth of 80 MBps. You can achieve sustained data rates as high as 60 MBps in non-RAID mode and 35 MBps in RAID mode.

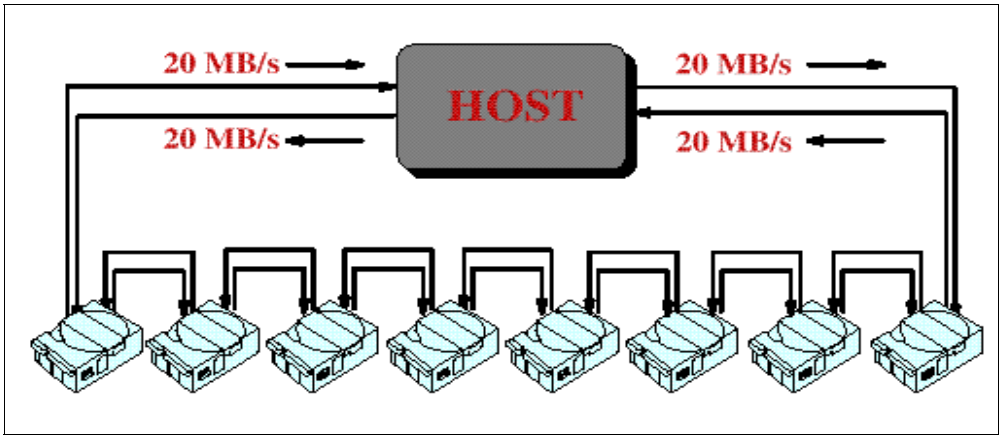


Figure 1. Bidirectional SSA Loop

SSA connectivity is extremely adaptable and it requires only thin copper cables to connect devices together. As SSA is a serial communication protocol it only needs two twisted-pair copper cables for a full-duplex data transfer between two devices. Because you can use thin copper cables, the quality and the protection of the cables is much better than with SCSI. You get an improved signal quality that allows higher clock rates on the cable and distances of up to 25 meters between adapters, drives or subsystems with copper cables. With the SSA Fiber-Optic Extender feature installed on the SSA subsystems 7133 you can even reach up to 2.4 km (7874 feet) by using fiber optic cables. This flexibility allows you to position storage subsystems in secure locations and mirror subsystem over long distances.

SSA has link error recovery procedures and an automatic path selection for alternative paths. Through a loop configuration, SSA prevents a cable failure from exerting influence on access to data, making it a good choice when high-availability implementations are needed. When data is sent from the adapter, it may transfer over the cable in either direction. If SSA detects interruptions in the loop, it can automatically reconfigure to preserve the connection. When the faulty cable is replaced the loop will automatically reconnect. This ability is also useful to extend a running system. You can open one connection and add an additional subsystem and close the loop again. The server need not be brought offline, as all SSA cables and disk drives are hot swappable.

In addition, SSA offers you some other unique capabilities. The IBM SSA RAID PCI Adapter and IBM SSA RAID Cluster Adapter have four ports to build two loops. You can connect up to 96 SSA disk drives per adapter; this means 48 disk drives per loop.

The IBM SSA RAID PCI Adapter supports the implementation of RAID-0, RAID-1 and RAID-5. The drives can be configured in as many as 32 arrays, each with 3 to 16 disk drives with RAID-0 and RAID-5, and in pairs with RAID-1. The adapter can also support non-RAID drives.

The IBM SSA RAID Cluster Adapter is developed particularly for failover cluster support with Windows NT and the Microsoft Cluster Server (MSCS). You can create up to 22 RAID-1 arrays in disk pairs and non-RAID drive configurations are also supported.

Up to three SSA RAID Adapters can be installed in the Netfinity 7000. This means that up to 288 disks can be connected to one server. With 9.1 GB disks, this equates to 2.6 terabytes of online storage.

Note: In your RAID configuration planning, remember that Windows NT restricts the number of usable data and system partitions throughout the amount of available drive letters.

At the moment you can connect only hard disk drives to an SSA adapter. You cannot connect CD-ROMs, tape drives or any of the other devices as you can with SCSI. Therefore, if you want to use SSA, you will most likely need to use SCSI as well.

For more detailed information about SSA technology see *Implementing PC ServeRAID SCSI and SSA RAID Disk Subsystems,* SG24-2098.

SSA Solutions for SAP R/3

- SSA Adapters
  - IBM SSA RAID PCI Adapter
  - IBM SSA RAID Cluster adapter
- External SSA Enclosures
  - SSA Entry Storage Subsystem 3527 5-bay mini-tower enclosure (5 half-high hot-swap bays)
  - 7133 SSA Disk subsystem 16-bay tower or rack mounted enclosure (16 half-high hot-swap bays)

Note: The SSA Solutions are only supported in Netfinity 7000 and PC Server 704 for SAP R/3.

1.1.1.5 IBM ServerProven Solutions

You can get a lot of approved, tested and supported IBM and non-IBM options for your Netfinity servers. IBM created for this purpose the ServerProven program. IBM ServerProven is a compatibility program for IBM and third-party hardware options, network operating systems and complete application solutions to thoroughly test and validate compatibility with IBM Netfinity and IBM PC Server systems. So you reduce the integration risks for a complete solution and your installations are more fine-tuned and implementations are more reliable. This gives you the flexibility to extend your Netfinity Servers with capabilities you need.

You will find the IBM ServerProven Solutions on the World Wide Web at http://www.us.pc.ibm.com/serverproven.

1.1.2 Control and Manageability

IBM offers and supports a wide range of complementary solutions that enhance your system on SAP R/3. IBM provides excellent data and system management tools such as Netfinity, Tivoli or MQSeries and for data backup and recovery the Adstar Distributed Storage Manager (ADSM).

Predictive Failure Analysis and Advanced System Management Adapter are hardware extensions that together with the complementary products help you to manage and control your Netfinity servers.

1.1.2.1 Netfinity Manager

The Netfinity Manager Software is included in every delivered IBM PC Server and Netfinity Server. Netfinity Manager is a powerful system management tool that runs on IBM and non-IBM machines. You can manage your workstations and servers locally or remotely over your network, a serial link or even the World Wide Web. It always gives you current information about the status of your machines.

1.1.2.2 Predictive Failure Analysis

Netfinity server components include predictive failure analysis (PFA), which warns you about impending hardware defects before they occur. This gives you more time to plan actions to solve a hardware problem. You can get PFA alerts from hard disks, power supplies and fans. These components are hot-swappable in some Netfinity servers so you can change them without powering down the machine. If a PFA error occurs, the Netfinity Manager will send you an alert.

1.1.2.3 Advanced System Management Adapter

The Advanced System Management Adapter (ASMA) gives you, together with the Netfinity Manager, the possibility to check your system status even when your system is down.

The Advanced System Management Adapter has a built-in service processor and two serial ports. It works independently of your system. It keeps you informed about the status of your systems and send you alerts if a hardware defect occur. The ASMA card has its own error log to check what has happened when your system goes down.

The ASMA card will recover your system automatically if it hangs. You can also power off and power on your system remotely and monitor the power-on self-test (POST) with the Netfinity Manager.

1.1.3 Service

- With your Netfinity 7000 you get an industry-leading three-year onsite limited warranty and 90-day startup support.
- IBM offers worldwide 24 hours per day, 7 days per week and 365 days per year service and support. IBM provides the Tech Connect Program for business and customer training and information.
- IBM has a worldwide presence and competence in the SAP R/3 business. There are more than 26 international and regional IBM SAP Competency Centers worldwide. The IBM SAP Competency Centers do sizing and configuration support for SAP R/3. More than 4000 SAP R/3 experts are working for IBM worldwide. The IBM Global Service organization for SAP R/3 is incomparable. IBM provides seamless support, from initial consulting to installing, implementing and training of the SAP R/3 system.
- There are thousands of experienced PC Business Partners worldwide who give excellent support and service to customers on R/3 systems.
- IBM SystemXtra bundles technologies, network and support services, software, training and financing into a comprehensive, cost-effective solution package for customers.

  You will find more information about SystemXtra on the World Wide Web at http://www.pc.ibm.com/us/systemxtra/systemxtra.html.

- A new major enhancement of service and support for Netfinity servers is the *Call Home* remote support, using the latest technology advances delivered by the IBM Netfinity 7000. Once available only in typical mainframe environments, it is now available for an Intel processor-based server. If your server experiences a problem, it will dial IBM to set in motion the right level of support to keep your system up and running. In addition, you can select options to have IBM contact you or your approved warranty service provider.

  Using the multiple technologies in IBM's newest Netfinity server, Netfinity Manager software and the Advanced Systems Management Adapter, this new support capability allows it to remotely deliver hardware-problem determination, launch on-site resources if needed and invoke any level of support, including product engineering, within minutes. Included in this new offering is a comprehensive problem-management system that provides tracking, management, escalation and transfer of problem ownership to the appropriate skills required to resolve an issue.

1.1.4 Implementation of High Availability

High availability means redundancy in all areas of a server system to make sure the server is also available to the users in the case of hardware or software failure. Netfinity Servers represent already a lot of high availability functions on the hardware level. For more information about high availability on Netfinity servers in the SAP R/3 area see 1.8, “High Availability” on page 12.

1.2 What is SAP R/3?

SAP is one of the largest software companies, providing integrated client/server business solutions covering accounting, human resources, logistics and product planning etc.

SAP stands for Systeme, Anwendungen and Produkte (Systems, Applications and Products).

R/3 stands for Real-time system Version 3. Its predecessors, R/1 and R/2, were real-time systems like R/3, but were available only on mainframes.

SAP R/3 is a very powerful modular application designed to integrate a company's data. Everyone in a company can have access to the same data stored in a common RDBMS.

SAP R/3 is a mission-critical business application that provides dynamic information management for enterprises of all sizes of diverse industries.

The applications of the R/3 system are based on an overall business model that makes possible a uniform view of all data and business processes in the enterprise. The overall model covers the application areas shown in Figure 2.

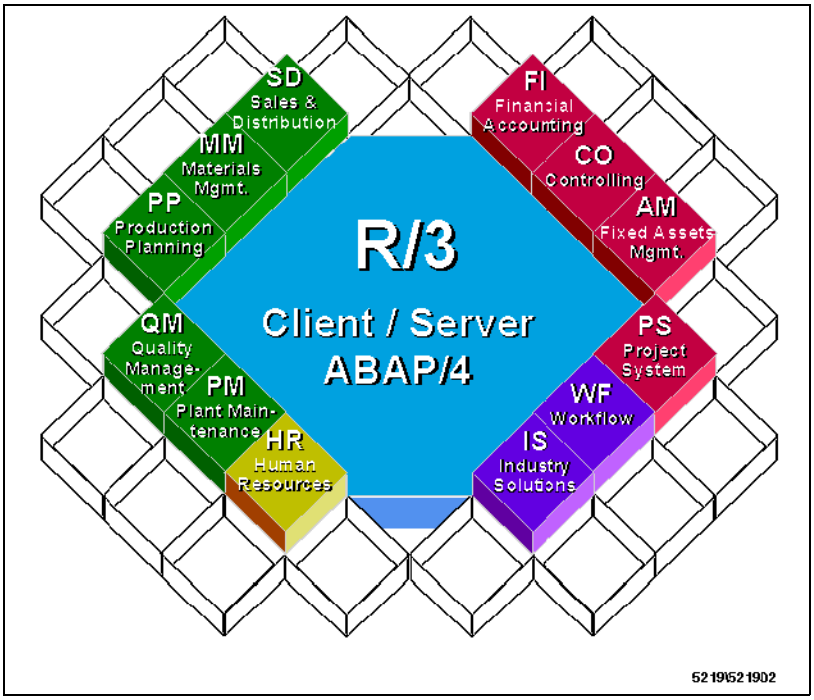


Figure 2. SAP R/3 Modules

The applications in R/3 are modules designed to tap the company's performance potential. They link operational steps to forge automated workflow chains, control the flow of information from one department to another, and connect the company with its customers and suppliers.

1.3 Why R/3 Applications Excel

- R/3 brings together people who work on shared tasks within the same company, in a network of companies, or in their dealings with customers and business partners.
- R/3 unlocks ways to optimize organizational structures for a smoother flow of information at all levels and between all parts of the organization.
- With integrated workflow management and access to up-to-the-minute information, R/3 lets employees assume greater responsibility and work more independently.

1.4 The Openness of R/3

With SAP R/3, you can do the following:

- Link together R/3 systems or loosely coupled distributed R/3 applications.
- Link both third-party software and popular desktop programs such as MS Word, MS Excel etc. to R/3 applications.
- Integrate specialized systems for CAD, plant data capture, or mobile data entry.
- Incorporate industry-specific solutions such as geographic information systems (GIS).

- Include enhancements to R/3 applications, such as systems for production optimization and transportation planning.
- Open up new business opportunities with electronic commerce (seamless integration of R/3 with Internet).
- Use Java Technology to make R/3 available to your users with a familiar GUI on the Internet.
- Include fax, electronic mail, optical archiving systems, and multimedia tools in the R/3 System's business applications.
- Electronically transmit via EDI, receive, and process data from R/3 applications.
- Build cooperating groups of solutions between R/3 applications and SAP's R/2 system.

1.5 SAP Architecture

an SAP R/3 system is architecturally implemented as a layered model. There are two main layers:

- Basis
- Application

The basis layer contains the R/3 system middleware. It is this middleware layer that makes applications independent of the hardware platform, including the operating system, database system, and the communication protocol that will be used.

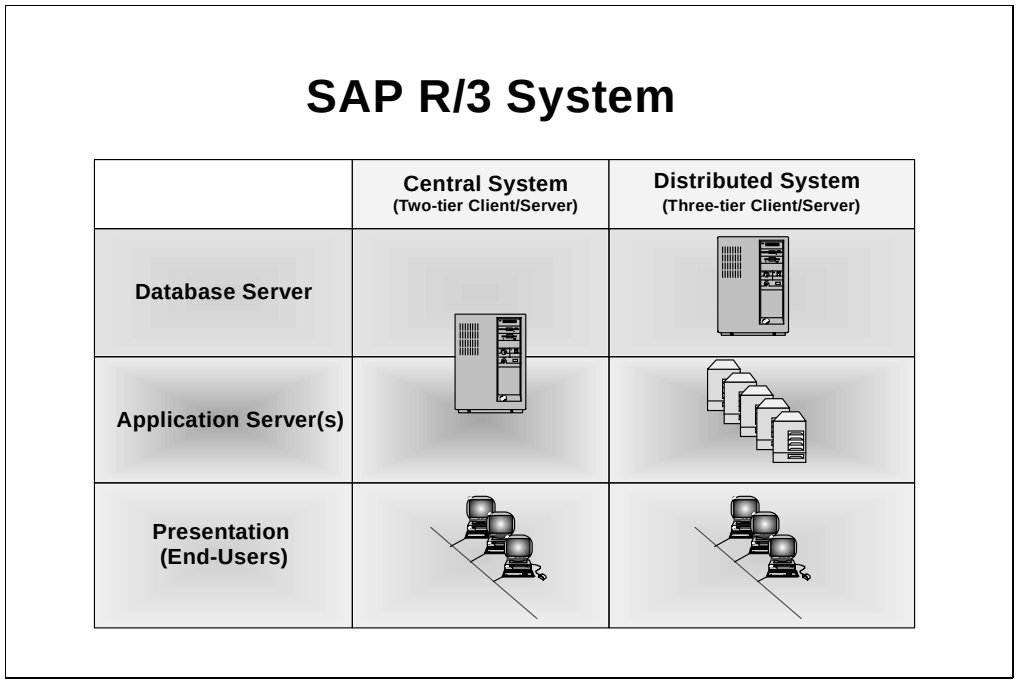


Figure 3. Layered Architecture of the R/3 System

Figure 3 shows a Windows NT operating system using a DB2 database that uses TCP/IP as the communication-specific protocol to support remote clients.The R/3

middleware, or basis layer, is that portion of an R/3 system that is ported to specific environments as written in C and C++.

The ABAP/4 Development Workbench is the SAP programming environment used to develop client/server applications. The programming is done using SAP 4GL ABAP/4 language.

1.6 Client/Server R/3 Architecture

In this section we discuss briefly the fundamental architecture of the R/3 system. The R/3 system makes a clear distinction between the database, application and presentation layer but it also identifies the *Internet enabling layer*, which is new in Release 3.1. These layers, which are a part of R/3 system, are fully scalable. The client/server R/3 architecture is shown in Figure 4.

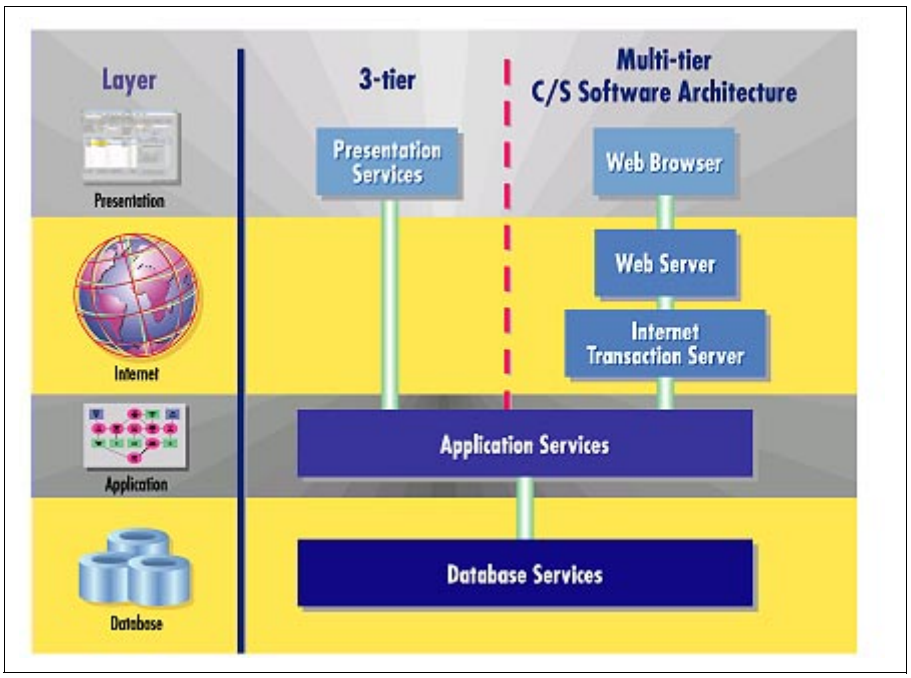


Figure 4. Three-Tier R/3 Model

1.6.1 Database Layer

The database layer manages the complete data of an organization. The industry-standard SQL (Structured Query Language) is used for defining and manipulating all data.

1.6.2 Application Layer

The applications that are based on the DBMS constitute the application layer. These work with data that they retrieve from these layers and write the new data back to the database. Each application server has a single *Dispatcher* that manages the work load of the instance. The presentation server interacts with the dispatcher. End-user requests and units of work are assigned by the dispatcher to the work processes of the instance for completion. *Work processes* are jobs within the R/3 subsystem that actually perform the work. Each work process is

assigned a primary role by the dispatcher that will control, to a certain degree, what type of work will be performed by that work process. The number of work processes and the types that can exist for an instance are controlled by the instance profile. The duration of a work process is the time between screen input and screen output from the presentation server. The work process starts a *commit* before the output is displayed to the screen. The R/3 system applications and custom-written application enhancements developed using the ABAP/4 Workbench are processed in this layer.

Since Internet technology does not handle business transactions on its own, the *Internet enabling layer* has been created above the application layer. The Internet enabling layer extends the three-tier R/3 architecture into a multi-layer internet architecture.

1.6.3 Presentation Layer

The presentation layer of R/3 is called *SAPGUI*. It is closest to the user and provides a graphical user interface for the end user.

A *two-tier configuration* is a hardware configuration in which a single machine serves as the application server and the database server. It does not need to interact with another machine to service the R/3 end-user requests.

In a *three-tier hardware configuration*, an application server is not a stand-alone server. It must work in conjunction with a database server in order to provide the end user with services. There may be multiple application servers in a three-tier configuration.

To summarize, in the R/3 system, the data manipulation (the database server) is separated from the execution of programming logic (application servers), which in turn is separated from the presentation of data and control of user interaction (front end servers). The protocol between the application server and the presentation server is minimized to keep the network traffic as low as possible.

1.7 SAP Releases

There have been the following SAP R/3 releases to date:

- 2.1
- 2.2
- 3.0 (3.0A,3.0B,3.0C,3.0D,3.OE,3.0F)
- 3.1 (3.1G,3.1H)
- 4.0 (4.0A)

Version 4.0A is the latest SAP R/3 version.

R/3 3.1 integrated numerous R/3 Internet applications. Also, R/3 3.1 offers more than 150 new process-oriented business application programming interfaces (BAPIs) for third-party vendors and developers.

Release 4.0 can manage the entire value chain from point-of-sale to point-of-production. It has enhanced key logistics, human resources, and financial functions that extend the enterprise. Release 4.0 contains a broad array

of new functions that improve your value-chain management and time to market. In addition to these features, SAP will ship two industry-specific solutions as components of the standard system: R/3 Retail for the retail sector and R/3 Public Sector for public institutions.

1.8 High Availability

SAP R/3 is a business-critical network application and users are usually sensitive about unplanned system idle time resulting from server breakdowns. Every minute of unplanned system idle will cost a company a lot of money.

High availability features are designed to keep the systems running in the case of a system failure. They are usually integrated in different system areas such as hardware, operating system and application software. In addition, there are particular solutions developed to assure high availability in operating systems.

1.8.1 High Availability on the Hardware

IBM Netfinity Servers use fault-tolerant and high-availability subsystems such as redundant and uninterrupted power supplies and fans, RAID-protected storage, ECC memory, supported redundant network adapters and hot-swap components. To avoid power problems, we recommend the use of a Uninterruptible Power Source (UPS). IBM provides the American Power Conversion (APC) product line to reach an extra layer of protection with an UPS.

For detailed information on the range of products, please review *IBM PC Server Technology and Selection Guide,* SG24-4760.

The following is a partial list of high availability features for selected IBM hardware components:

Netfinity 7000

- ECC memory
- Redundant, hot-swappable and PFA alerting fans
- Optional redundant power supplies
- Hot-swappable and PFA alerting power supplies
- Hot-swappable and PFA alerting hard disk drives
- Auto recovery if a processor failed
- Auto recovery if memory failed
- Advanced System Management Adapter standard
- Supported RAID Adapter
- Supported redundant Network Interface Cards (NIC)

Netfinity EXP10 Storage Expansion Unit 3520

- Redundant and hot-swappable fans
- Redundant and hot-swappable power supplies
- Hot-swappable and PFA alerting hard disk drives

7133 SSA Disk subsystem

- Redundant and hot-swappable fans and power supplies
- Hot-swappable hard disk drives

Advanced System Management Adapter

- Integrated Watchdog Timer

- Auto recovery features if the operating system hangs

IBM ServeRAID II Adapter

- RAID-0, RAID-1, Advanced RAID-1 and RAID-5 capabilities
- Hot-Spare and Automatic rebuild capabilities
- RAID array spanning over three SCSI channels
- MSCS enabled
- Optional 8 MB battery backup cache

1.8.2 High Availability on the Operating System

Windows NT implements some fault tolerance and high availability features as well. You can establish disk mirroring or build stripe sets with parity over your hard drives to improve your data availability. In addition, there is a function available that can initiate a system reboot whenever a stop error occurs (blue screen).

1.8.3 High Availability and SAP R/3

The R/3 technology comprises instruments for managing and controlling the current operation of a system and technology for ensuring that system down time, whether planned or unplanned, is kept as short as possible.

The administrator can monitor the status of R/3 operations that are running on database, application, operating system and network level with the Computing Center Management System (CCMS). Procedures and checklists help the administrator to recognize time-critical situations and address them before a failure occur. The CCMS has graphical performance monitors and keeps statistics that make possible to tune the system and give you a overview of the whole R/3 System.

In addition, the SAP AG offers an option to integrate the R/3 System in existing network and system management platforms by using the Management Information Base (MIB) of the Simple Network Management Protocol (SNMP). The R/3 MIBs define interfaces for application monitoring and controlling and for alarm handling.

The SAP AG has implemented a form of automatic software distribution for new release upgrades that allows you to distribute the new imported software over several different servers without interrupting normal operation. This procedure implements a software version check on that application server where a transaction is called. It will execute an automatic update if the current version of the software is not present. This process avoids the time-consuming procedures that appear during common release upgrades.

The SAP AG is always developing new technology such as the repository switch, the support provided by comfortable graphical user interfaces and fully automated procedures or importing new releases to keep the required time for a release upgrade to a minimum. That all helps to save large amounts of time and to reduce costs and is important for business-critical applications such as SAP R/3.

1.8.4 Clustering

For an additional level of high availability, clustering solutions for your Netfinity Servers are obtainable. IBM offers a diversity of high-availability clustering choices:

- Microsoft Cluster Server (MSCS) for a shared-disk configuration
- Vinca High Availability offerings for a shared-disk configuration
- Vinca StandbyServer for a mirrored-disk configuration

A clustering solution will prevent the R/3 System from being unavailable for the customer if a hardware or software failure occurs. For the SAP R/3 and Windows NT environment it is only important to take the Microsoft Cluster Server into consideration. IBM does not offer or support other solutions than MSCS in the SAP R/3 environment. Microsoft Cluster Server is currently available as a part of Windows NT Server Enterprise Edition.

Microsoft Cluster Solution is divided into three phases. Only the first phase is finished and released.

The first phase of the Microsoft Clustering Solution is a failover solution with two nodes in a cluster which have access to a shared disk subsystem. But only one server gets access to a disk resource at time. This technology is known as *shared disk but shared nothing*.

Both nodes are available to run applications at the same time. Figure 5 shows an example of a clustered SAP R/3 environment, where one node becomes the database server and one an application server with the central instance. Central instance includes the message server and the enqueue server together. These three components must be running to keep the R/3 system available to the customer.

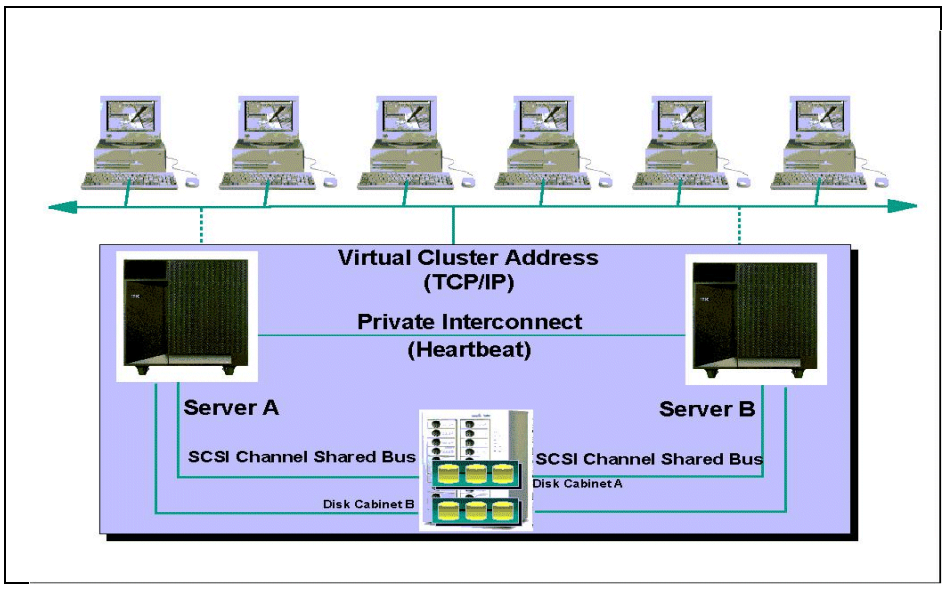


Figure 5. Example of a Clustered SAP R/3 Environment

If a hardware or software error occurs, the surviving server will take over all resources and restart the applications. This process is known as *failover*. If the

failing server comes back online and takes over its applications, then this process is known as *fail back*.

The second phase of Microsoft Cluster Server will implement failover with more than two servers and the third phase will incorporate workload balancing and cluster management solutions for NT servers.

IBM has certified three fundamental hardware configurations for Microsoft Cluster Server. They are listed on the Microsoft Hardware Compatibility List (HCL). Only Microsoft-certified hardware configurations will be supported.

You can find the Microsoft HCL on the World Wide Web at http://www.microsoft.com/hwtest/hcl.

The disk controller and the shared subsystems are the main criteria for a MSCS certification.

The certified configurations are:

- The external hardware-implemented RAID enclosure system Symbios Logic MetaStor DS-20E combined with a differential SCSI controller
- The external SCSI storage expansion enclosures IBM 3518, IBM 3519 and IBM EXP10 combined with the IBM ServRAID II Ultra SCSI Adapter
- The external storage subsystem IBM 7133 for Serial Storage Architecture (SSA) combined with the IBM SSA Raid Cluster Adapter

Note: The SSA Solutions are only supported in Netfinity 7000 and PC Server 704 for SAP R/3.

In addition, IBM developed an MSCS tool called the IBM Cluster Systems Manager (ICSM). It brings you enhanced management control of clustered environments and delivers integrated systems management functions for the management tools IBM Netfinity Manager, Intel LANDesk and Microsoft Systems Management Server (SMS). With ICSM you will get a tool to simplify your administrator tasks throughout GUI-based dynamic and intuitive use of wizards, configurable alert generation and single-console view to the cluster topology.

The SAP AG modified the R/3 kernel software for optimized MSCS support and added some programs and special Dynamic Link Libraries (DLL) to espouse the particular capabilities of the MSCS, so that it will be the clustering solution of choice for R/3 implementations. The SAP AG will deliver R/3 NT with MSCS as a standard solution and provide a switchover kit for clustering as a change to the SAP R/3 kernel 3.1H. But this version is a first customer shipment (FCS), which means the SAP AG will deliver it only to hardware partners and selected customers. This version is for test use only. The later versions of SAP R/3 3.1I or 4.0B with the switchover kit will then support production environments.

The SAP AG supports for clustering all Microsoft-certified and MSCS-enabled databases. Currently only Oracle offers with Oracle fail-save such a solution for MSCS. Other products such as MS SQL Server, Informix and DB2 will follow.

Chapter 2. Configuring the Hardware and Installing Windows NT

This chapter and Chapter 3, “Installing the SAP R/3 Base System” on page 89 describe an easy way to set up SAP R/3 on your system. The chapters guide you through the several steps required to assure a reliable SAP R/3 system.

The installation steps focus on the following hardware and software installations.

- Hardware:
  - The IBM Netfinity 7000
  - IBM ServeRAID II Adapter
  - IBM Netfinity EXP10 Storage Expansion Unit
  - Ethernet and token-ring network cards
  - APC Smart-UPS
- Software:
  - SAP R/3 Release 3.1G
  - Upgrade SAP R/3 Release 3.1G to 3.1H
  - Oracle Database Management System (DBMS)

This chapter is a complete guide to preparing a Netfinity 7000 and its environment for the SAP R/3 installation. It provides information about configuring the hardware during the presale phase and instructions for installing the hardware and Windows NT 4.0 on the Netfinity 7000. It gives you hints and tips for addressing possible problems. It helps you to get your system successfully up and running as fast as possible.

Handling Electrostatic Discharge-Sensitive Devices

Any computer part containing transistors or integrated circuits (ICs) should be considered sensitive to electrostatic discharge (ESD). ESD damage can occur when there is a difference in charge between objects. You can protect against ESD damage by equalizing the charge so that the machine, the part, the work mat, and the person handling the part are all at the same charge.

You should always wear a grounded wrist strap against your skin to eliminate static on your body.

2.1 Drivers and Updates

Before you start the installation make sure that you have all needed diskettes with the latest drivers, firmware and BIOS updates. It is important to install the latest drivers, updates, patches and fixes, in order to avoid known and fixed problems. Please refer to the following World Wide Web sites for the latest updates:

- http://www.pc.ibm.com/files
- http://.

© Copyright IBM Corp. 1998

Type the product name, such as Netfinity 7000 or ServeRAID, in the search field and you will get a list of all needed drivers and diskettes.The following table provide an overview of the diskettes needed during this installation and show the latest versions at the time of publication.

Table 1. Netfinity 7000 Bios and Driver Diskettes

Category	Diskette Packages
Netfinity 7000	BIOS/Flash Update
	System Configuration
ServeRAID Adapter	BIOS/Firmware
	Configuration
	Administration
	Supplemental Programs
	4.5 and 9.1/ GB Update
Advanced System Management Adapter	Configuration
	Service Process Manager Installation
Network Adapter Diskettes	**Note:** Many different network adapters are currently available. Go to the World Wide Web for the latest list and drivers.

2.2 Uninterruptible Power Source Systems

The most critical resource required for a running system is power. If your power fails your system will stop. The volatile storage components such as cache and memory are the most sensitive points in this case. These components will lose all their data if the power fails. You will need at least a system which gives you time to save your data, close your applications and shut down your database and operating system. The following topics show which power problems you might expect. Uninterruptible Power Source (UPS) systems were designed to shield systems from most of these power problems and prevent a computer failure.

- **Sag:**

  Sags, or brownouts, are short-term decreases of the voltage level. This is the most common power problem. Sags typically cause frozen keyboards and system crashes.They also tend to shorten the life of electric motors, such as disk drive motors and fans.

- **Blackout:**

  Total loss of power. This leads to a total system stop, which can cause loss of any data stored in volatile components. Also, problems might occur when trying to restart the system (disk allocation errors, damage to components).

- **Spike:**

  A spike is an instantaneous, dramatic increase in voltage. Spikes are typically caused by a nearby lightning strike or when utility power comes back on line. Damage to hardware can occur.

- **Surge:**

A short-term increase in voltage, typically lasting at least one hundredth of a second. Surges are caused by the stopping of nearby high-powered electrical motors such as elevators. Computers are designed to receive power within a certain voltage range. Anything outside of this range will stress delicate components and cause premature failure.

- **Noise:**

  Noise is a phenomenon where another type of wave form is superimposed on the normal sine wave of power. Electrical noise is caused by many factors, including lightning. Noise introduces glitches and errors into executable programs and data files. When intermittent, it is probably one of the hardest problems to isolate. Typically, software will experience hangs and machines will reboot for no apparent reason.

IBM and the American Power Conversion (APC) formed a relationship to meet essential UPS requirements for minimizing damage and loss associated with power problems. The solution offered by IBM for protecting your system integrates requirements for protection against power source irregularities that your IBM Netfinity and IBM PC Server systems must withstand to maintain data reliability.

IBM UPS Solution highlights:

- Corrects brownout conditions
- Corrects over-voltage conditions
- Implements user-replaceable batteries
- Conducts tests for site-wiring faults (missing ground, reversed polarity)
- Quick battery recharges and extends life of batteries with precision float charge
- Supports intelligent Serial and Simple Network Management Protocol (SNMP) communications
- Multiple Server Support
- Intelligent monitoring and management software PowerChute *plus*
- PowerXtend a plug-in module for integration in IBM Netfinity Manager

2.2.1 UPS Product Range

The following list is an overview of the offered UPS Solutions:

- APC Smart-UPS 700 SU700NET, 700 volt ampere/450 watt, freestanding model, part #94G3134
- APC Smart-UPS 1000 SU1000NET, 1000 volt ampere/670 watt, freestanding model, part #94G3135
- APC Smart-UPS 1400 SU1400NET, 1400 volt ampere/950 watt, freestanding model, part #94G3136
- APC Smart-UPS 1400 SU1400RMB, 1400 volt ampere/950 watt, rack-model, part #94G6674 (120 VAC)
- APC Smart-UPS 1400 SU1400RMiB, 1400 volt ampere/950 watt, rack-model, part #94G6675 (220-240 VAC)

- APC Smart-UPS 3000 SU3000RMB, 3000 volt ampere/2250 watt,rack-model, part #94G6676 (120 VAC)
- APC Smart-UPS 3000 SU3000RMiB, 3000 volt ampere/2250 watt, rack-model, part #94G6677 (220-240 VAC)

2.2.2 UPS Sizing

UPS sizing calculates the sort of UPS you will need for your specifications. You have to determine two factors to size your UPS:

1. The total load protected by the UPS in volt-amps
2. The needed on-battery run time

Use the following checklist to determine the total load:

1. Make a list of all equipment that requires protecting.

   Don't forget external devices, such as monitors, disk subsystems, network components and console switches.

2. Determine the load of each component.

   If you want to compare the total system load to the maximum UPS load you must determine your load in volt-amps. Obtain the load figures from either the labeling on the components or the accompanying system literature. For indications in watts, multiply the specified figure by 1.4 and for indications in amps, multiply the figure by your country-specific line voltage (110 volts or 220-240 volts).

3. Determine total requirements

   Add all volt-amps of each component together. This total will give you the total amount of volt-amps you need.

4. Size your UPS

   Use Table 2 to size your APC UPS. If you use a UPS from another manufacturer, consult its specification list. Most manufacturers have tables available, where you can determine the size of the UPS in function of needed volt-amps and run time.

Table 2. On-Battery Run Time in Minutes

VA LOAD	SU700NET	SU1000NET	SU1400 NET	SU1400RMB	SU3000RMB
200	38	58	90	69	135
250	26	44	71	54	113
300	20	36	57	44	96
350	17	28	47	36	84
400	14	24	39	30	74
450	121	20	33	25	65
500	9	18	29	22	58
600	6	13	21	16	47
700	5	11	18	12	38

Note: Your needed on-battery run time depends on the time for your shutdown procedure.

VA LOAD	SU700NET	SU1000NET	SU1400 NET	SU1400RMB	SU3000RMB
800	-	9	15	11	33
900	-	7	12	9	29
1000	-	6	11	8	26
1200	-	-	8	6	20
1400	-	-	7	5	16
1600	-	-	-	-	13
2000	-	-	-	-	9
2200	-	-	-	-	8
2500	-	-	-	-	6
3000	-	-	-	-	4
Note: Your needed on-battery run time depends on the time for your shutdown procedure.					

Another approach might be to choose a more powerful UPS, which will guarantee a few hours of battery power. When using this approach, your software must be able to initiate shutdown when a certain battery level is reached. The PowerChute *plus* software delivered by your APC UPS supports this feature of system shutdown. If you installed the Interface Expander in your APC UPS you can control three systems in this way by connecting them to serial ports on the UPS.

Table 3 shows you the on-battery time for selected server models.

Table 3. On-Battery Run Time for Selected Server Models

Model	Run-time Load	SU700NET	SU1000NET	SU1400NET	SU1400RMB	SU3000RMB
PC Server 325 Pentium Pro	265 VA	25 min.	42 min.	68 min.	49 min.	110 min.
PC Server 325 Pentium II	280 VA	23 min.	40 min.	64 min.	50 min.	105 min.
PC Server 330 Pentium II/PRO	300 VA	20 min.	36 min.	57 min.	-	-
Netfinity 7000	490 VA	-	-	31 min	23 min.	60 min.
Note: Stated run times and power are for typical configurations (70% of maximum capacity).						

2.2.3 Installing the APC UPS

First, you must install the *UPS Interface Expander* accessory. The Interface Expander provides two additional RS232 computer interface ports. Install it in the SmartSlot in your APC UPS. As your UPS has one RS232 interface port you can now provide a safe system shutdown for up to three servers.

The two serial interfaces on the Interface Expander are *Basic Monitoring Ports,* which means they report basic power status conditions such as *on-battery*, *low-battery* and *return of line power* to the attached devices. This is sufficient to control your systems if a power fail condition appears. Later you must install the

PowerChute *plus* software in the *Back-UPS* mode on the servers which are connected to this basic ports.

The computer interface port on the UPS is an advanced port with advanced notification and management features. Connect the server to this interface port where you plan to use the PowerChute *plus* software with its intelligent monitoring and control features such as UPS statistics, different voltage displays, battery capacity display, remaining run-time display, status indicators, particular configuration parameters and different diagnostic and self-test functions. This server will be responsible for UPS management and is becoming the *master* server. But you have access to this service over the network.

The PowerChute *plus* software is divided in a monitoring service and user interface. You can manage and monitor the advanced functions from every network-connected server or/and workstation where the PowerChute *plus* user interface software is installed. This station does *not* need to be connected to an UPS port and does *not* have to run the UPS service. The advanced interface port can also work as a basic monitoring port.

There is no difference whether you install an SAP R/3 application and database server on a basic port or an advanced port. There are no performance or security reasons that determine on which port you should install your SAP R/3 servers. Every server you want to shut down when the power fails must be connected to a UPS port.

For example you can connect a domain controller or a backup domain controller to the advanced port and install the PowerChute *plus* monitoring service and user interface program there. The SAP R/3 server would be connected to the basic ports and runs the monitoring service and can also run the graphical user interface.

2.2.3.1 The Interface Expander

The normal UPS standard operation during a utility failure is to run on battery until utility power is restored, or until the battery is exhausted. After a low battery warning interval, the UPS goes into shutdown mode and stops supplying power to the components.

Low Battery Warning Interval

The low battery warning interval is a low-battery signal sent to the computer interface ports approximately two minutes before the battery is exhausted. During this interval the UPS beeps continuously. Two minutes is the default setting for your APC UPS. You can adjust this setting to five or seven minutes. Please refer to your APC UPS user manual.

The Interface Expander adds three operating modes that cause a shutdown of the UPS by a user-definable mode. This is normally done to preserve battery capacity after the successful shutdown of the protected servers.

Note: Keep in mind that these additional operating modes are only to shut down your APC UPS and initiate a power cycle to restart your servers after utility power is restored. The real server shutdown is done by the PowerChute *plus* software.

Shutdown Modes:

1. Confirmed Shutdown Mode

   The Interface Expander shuts down the UPS after all servers that are connected to the three ports have reported that they are shut down.

2. Until Low Battery Shutdown Mode

   A similar mode to the UPS standard operation. The Interface Expander shuts down the UPS after the low-battery time interval.

3. Time Shutdown Mode

   In this mode the UPS operates on battery for a user-specified length of time before the Interface Expander shuts down. This is done by DIP switches. You can select 2,5,10,15,30 and 60 minutes.

The standard setting for the shutdown mode is *Confirmed Shutdown Mode.* Leave the Interface Expander for the SAP R/3 installation in this mode. You can adjust this mode by setting DIP switches in the Interface Expander Card. Please refer to your APC Interface Expander user manual.

2.2.3.2 Connecting the UPS

Plug your UPS into a three-wire grounded utility power outlet. You must not connect extension cords and adapter plugs between the UPS and the outlet.

We recommend that you charge the battery for 2.5 hours before you use the UPS the first time. The battery is charged whenever the UPS has a connection to utility power.

Then connect the *master* server to the advanced interface port of the UPS with the custom UPS 9-pin serial interface cable (part #940-0024C, usually the black one), shipped with APC smart signaling UPSs. The other servers will be connected to the basic ports of the Interface Expander with the RS232 cable (part #940-0020B, usually the gray one) for simple signaling shipped with the Interface Expander or the UPS.

Note

It is important to use the correct cable on the advanced interface port if you want to use the extended monitoring and management capabilities of PowerChute *plus* and the APC Smart UPS. The part numbers are located on the plugs of the serial cables.

During the software installation on the server connected to the advanced port the PowerChute *plus* software should automatically detect the UPS type and model. If so then you are using the right cable on the advanced port. For the servers connected to the basic ports, manually select the communication port and the UPS model *BACK-UPS* during the PowerChute *plus* installation.

Finally, you can connect the power cords of all protected devices to the power outlets on the UPS.

External Disk Subsystems

If possible always connect external disk subsystems to the same UPS system as the server where their data cables are connected to. If they are connected to different UPS systems and only the UPS system with the connected external disk subsystem loses utility power and shuts down after the battery is exhausted, you may lose data and/or your operating system will hang because your server is still running and your external disk subsystem is powered off without the operating system shutdown procedure.

But if you use mirrored external disk subsystems and one unit is the exact mirror of the other, then connect one external subsystem along with the server to one UPS system and the other subsystem can be installed to the same or, for better availability, to another UPS system.

Another configuration is a clustered server environment. If two servers share one external disk subsystem, then either connect all servers and subsystems to the same UPS system or connect the two servers to different UPS systems and try to share the power for the external disk subsystem between the two UPSs. For example the IBM Netfinity EXP10 Storage Expansion Unit has two redundant power supplies and each one of them has its own power connector. Each of the two power supplies can now be connected to a different UPS systems.

2.2.3.3 The APC PowerChute plus Software

This book does not cover a complete installation of the PowerChute *plus* software. You may find details about configuration and installation in the APC PowerChute *plus* installation and user guides. You can find these manuals in Acrobat Reader format (PDF) on the ServerGuide Application CD-ROM 3A. The following files are located in the directory \Pwrchute\En\NTnoext\Docs:

- RELNOTES.PDF -- PowerChute *plus* Release Notes for Windows NT
- INSTALL.PDF -- PowerChute *plus* 5.0 Installation Guide for Windows NT
- MANUAL.PDF -- PowerChute *plus* 5.0 User's Guide for Windows NT

Here are some considerations you should take into account before you install and set up the UPS software.

The PowerChute *plus* for Windows NT software comprises three modules that can be installed:

1. The monitoring service *ups.exe*

   This module is a Windows NT service and communicates with the UPS over the RS232 interfaces on the server and the UPS. The monitoring service logs data and events, notifies users of impending shutdowns, and when necessary, shuts down the server. To run this module the server has to be connected to a UPS over an RS232 link.

2. The graphical user interface program *pwrchute.exe*.

   You can control and configure the PowerChute plus program and monitor the UPS with it. You will get access to real-time data from a local monitoring service or over the network from remote installed monitoring services on other servers that are connected to a UPS.

3. Online help in HTML format.

Which Modules Should Be Installed?

- For the servers connected to a UPS serial port that you want to be monitored, install the monitoring service (UPS Monitoring Module).
- For UPS monitoring and configuration on this server, select the graphical user interface program (User Interface Module).
- You don't have to install the user interface on the monitored server. You can remotely monitor and configure a server over the network from another machine. This machine need not be connected to a UPS port. You install only the user interface on this machine.
- The graphical user interface program has the capability to perform monitoring across domains and subnetworks.
- Rights for access to the monitoring service are granted by the Windows NT user administration. There is no extra user administration used.

Note: You will be unable to configure PowerChute *plus* for a server locally if you do not select the user interface. We recommend that you install both modules on the servers which are connected to a UPS advanced port.

Server Shutdown in a SAP R/3 Environment

If the power fails and the PowerChute *plus* software shuts down your operating system without shutting down your R/3 systems, R/3 applications and databases close abnormally, which may cause files to be improperly closed, user requests lost, and databases corrupted.

The PowerChute *plus* software supports a command file named *shutdown.cmd* located in your PowerChute *plus* installation directory, which can be executed before the PowerChute *plus* software shuts down your operating system. You have to set up a configuration parameter which decides how much time it will take to execute the shutdown.cmd file successfully.

Calculate all time parameters for application and operating system shutdowns carefully and generously. Simulate a power failure and test your system before you run it in a production environment. For more information about setting up the timing parameters and application shutdown with the shutdown.cmd file, please refer to the *PowerChute plus User's Guide for Windows NT.*

The SAP R/3 system provides the following command line programs to start and stop R/3 instances, databases and application services.

- sapstart -- Starts an R/3 instance
- sapsrvkill -- Stops an R/3 instance
- sapntwaitforhalt -- Waits for a successful shutdown of an instance
- ntscmgr -- Starts or stops an R/3 service (Windows NT service)
- sapdba --To start or stop the database

The R/3 architecture allows you to do this remotely. For example a server with the central instance running can start or stop the service and the instance of another application server. For an entire list of the command line programs and two example scripts for starting and stopping an R/3 system with command line programs refer to the SAP R/3 system online documentation.

The SAP R/3 system on-line documentation can be installed on a stand-alone Windows 95 or Windows NT workstation from the SAP installation package without the R/3 system running.

To find the related information select in the on-line documentation the following: **Basis Components > System Administration > Computer Center Management System > R/3 System Administration > Starting and Stopping the R/3 System > Start and Shutdown Processing under Windows NT.**

Here are some example commands to shut down your R/3 system:

- Shut down an application server
  - sapsrvkill <app>_<sapsid>_<no1>
  - sapntwaitforhalt pf=\\<central>\sapmnt\<sapsid>\sys\profile\START_<instance1>_<app> SAPDIAHOST=<app> 120
- Shut down the central instance
  - sapsrvkill <central>_<sapsid>_<no>
  - sapntwaitforhalt pf=\\<central>\sapmnt\<sapsid>\sys\profile\START_<instance>_<central> SAPDIAHOST=<app> 120
- Stop an application server service
  - ntsmgr stop SAP<sapsid>_<no1> -m <app>
- Stop application server service:
  - ntsmgr stop SAP<sapsid>_<no> -m <central>
- Shut down the database (for example, Oracle DBMS)
  - sapdba -shutdown

Table 4. Command Line Parameters

Value	Description
<sapsid>	SAP R/3 System ID (example RDU)
<central>	Host name of your central instance (example ITSOSAP1)
<app>	Host name of an application/dialog instance (example 00)
<instance>	Central instance name (example DVEBMSGS00)
<instance1>	Application instance name (example D00)
<no>	Central instance number (example 00)
<no1>	Application instance number (example 00)

If you are not sure about the values, you can look at the definitions in the profiles or you can list the directory of the profiles. The file names show you all the information you will need. The profile path is:

\\<central>\sapmnt\<sapsid>\SYS\profile

The profile directory for our installation is shown in the following figure.

```
U:\usr\sap\RDU\SYS\profile>dir
 Volume in drive U is sapnt
 Volume Serial Number is 98E6-6C0B

 Directory of U:\usr\sap\RDU\SYS\profile

04/24/98  09:10a       <DIR>          .
04/24/98  09:10a       <DIR>          ..
04/09/98  03:25p                1,134 DEFAULT.BAK
04/15/98  02:54p                1,349 default.pfl
04/15/98  03:57p                7,396 RDU_D00_itsosap2
04/15/98  03:57p                4,069 RDU_D00_itsosap2.BAK
04/14/98  09:31a                7,159 RDU_DVEBMGS00-itsosap1.ng
04/21/98  01:09p                7,134 RDU_DVEBMGS00_itsosap1
04/21/98  01:09p                7,006 RDU_DVEBMGS00_itsosap1.BAK
04/15/98  02:54p                1,428 START_D00_itsosap2
04/15/98  02:54p                1,753 START_DVEBMGS00_itsosap1
04/13/98  11:03a                1,753 START_DVEBMGS00_ITSOSAP1.B
              12 File(s)         40,181 bytes
                          6,187,073,536 bytes free
```

The exact shutdown strategy depends on your own environment, such as which R/3 installation (two-tiered or three-tiered installation) or UPS sizing is used.

If you have a distributed system with several application servers connected to different UPS systems, you have to consider some things.

The monitoring service, loaded on every server connected to the UPSs, is responsible for the system shutdown of its server. If the utility power fails then it fails usually for all UPS systems. When configured, the monitoring services will shut down all servers and all works fine.

But if only one or not all UPS systems lose their utility power and you have configured the servers so that they only shut down their own services and applications, that could cause unexpected problems because important parts of the SAP R/3 system would be shut down and other parts are still running.

Therefore, the system shutdown for the servers must be configured depending on the kind of server it is.

Initiate the following actions (in the shutdown.cmd) on the respective server if the utility power of its UPS fails:

1. On a centralized server (two-tiered solution)
    - Notify all R/3 users about an impending system shutdown.
    - Shut down the centralized R/3 system instance.
    - Stop the R/3 central instance service.
    - Shut down the database.
    - Shut down the operating system.
2. On a database server without application or central instance
    - Notify all R/3 users about an impending system shutdown.

- Shut down remotely all R/3 application instances on application servers that are connected to another UPS and then stop remotely their R/3 application instance services.
- Shut down remotely the R/3 central instance if it connected to a different UPS system and then stop remotely its R/3 central instance service.
- Shut down the database.
- Shut down the operating system.

3. On a database server with central instance
   - Notify all R/3 users aboutan impending system shutdown.
   - that are connected to another UPS and then stop remotely their R/3 application instance services.
   - Shut down the R/3 central instance.
   - Stop the R/3 central instance service.
   - Shut down the database.
   - Shut down the operating system.
4. On an application server with central instance
   - Notify all R/3 users aboutan impending system shutdown.
   - Shut down remotely all application instances on application servers which are connected to another UPS and then stop remotely their R/3 application instance services.
   - Shut down the local R/3 application instance.
   - Stop the local R/3 application instance service.
   - Shut down the R/3 central instance.
   - Stop R/3 central instance service.
   - Shut down the operating system.If the UPS system where the database server is connected to is not affected, you do *not* have to shut down the database server.
5. On an application server without central instance
   - Notify the R/3 users signed on to this server about impending system shutdown.
   - Shut down the local R/3 application instance.
   - Stop the local R/3 application instance service.
   - Shut down the operating system.

2.2.3.4 The PowerChute Plus and Netfinity Extension PowerXtend

IBM and American Power Conversion (APC) have worked together to develop a software extension that allows you to manage the APC Uninterruptible Power Supplies with the Netfinity Manager.

They developed the program PowerXtend as a plug-in module to Netfinity Manager. It provides integration into the following Netfinity Manager components:

- System Information
- System Monitor
- Alert Manager
- Event Scheduler

Please refer to Appendix 5.3.5, “Netfinity Manager Functions” on page 121 for more information about Netfinity Manager modules.

Information about installing and using PowerXtend with Netfinity Manager is found in *Netfinity Server Management,* SG24-5208.

PowerChute and PowerXtend must be installed on both the Netfinity Manager and any machine whose UPS information you want to manage via Netfinity Manager. PowerChute *plus* must be installed before installing PowerXtend.

You can also use the PowerXtend module and the Netfinity Manager with the Alert Manager to execute a batch file and shut down your system if the utility power fails. But you have to decide if you want to use PowerChute *plus* or Netfinity Manager to shut down your system.

Warning

Do not configure Netfinity Manager to issue this action if PowerChute *plus* is already configured to automatically perform the shutdown. If Netfinity Manager and PowerChute are both configured to initiate a shutdown in response to the same event, the shutdown delay that occurs may not be the one you expect, especially if you change the delay through one of the interfaces but are not aware of the configuration in the other interface.

2.3 IBM Netfinity 7000 Processor Upgrades

You may have to upgrade your system with more processors and memory, and that applies usually to an SAP R/3 system, depending on your sizing recommendations and your system configuration. First, let us consider the processor cache sizes.

2.3.1 Processor Cache Sizes in SMP Environments

SMP systems provide better performance by adding additional processors to the system. This performance growth is not increasing proportionally with the number of added processors. One problem of SMP systems is the *shared memory problem*. All processors use a single source of memory. Only one copy of the operating system is running on the system.

If a processor has access to the main memory and another processor needs access to the memory then it has to wait until the first processor is finished with the memory. This problem can be reduced by using cache memory. Cache memory holds recently accessed data. If a processor needs data that was recently accessed it is possible that the data might still be in the cache memory. If the processor found the data in the cache it does not need access to the main memory. Every time the processor finds data in the cache is called *cache hit*. The cache hit rate can be improved by increasing the size of the cache memory used by each processor. This is especially important for SAP R/3 integrations with a large amount of memory in SMP environments. On the other hand, there is the consideration that cache memory is usually expensive.

The Pentium Pro processors contain a 5.5 million transistor processor core with 16 KB primary cache (first level cache), and a 512 KB or 1 MB secondary cache (second level cache).

Remember

One advantage of the Pentium Pro processor in SMP environments is that every processor has its own integrated second level cache. As the second level cache is integrated on the processor it works with the same clock speed as the processor itself. In older Pentium SMP environments the second level cache and shared memory were integrated on the system board.

2.3.2 Installing the Processor Upgrade

The Netfinity 7000 comes standard with 256 MB main memory and one processor installed. There are four different standard models available:

- Netfinity 7000 8651-TM0 tower model, Pentium Pro 200/66MHz, 512KB L2 cache
- Netfinity 7000 8651-TH0 tower model, Pentium Pro 200/66MHz, 1MB L2 cache
- Netfinity 7000 8651-RM0 rack model, Pentium Pro 200/66MHz, 512KB L2 cache
- Netfinity 7000 8651-RH0 rack model, Pentium Pro 200/66MHz, 1MB L2 cache

The IBM Netfinity 7000 Server is SMP-capable with one to four Pentium Pro 200 MHz processors.

SMP Upgrade

If multiple processors are installed, they must operate at the same speed and have the same cache size. There are different stepping levels of the Pentium Pro processor that can be mixed within the same system and ones that cannot be mixed. Your best bet will be to order the original IBM upgrades for your Netfinity 7000 system to ensure that you get a reliable and supported system (option #94G7147 for the 200MHz/1MB and option #94G6678 for the 200MHz/512KB processor upgrade kit).

The Netfinity 7000 system board has two slots for processor boards and each system ships with two processor cards. The system board has a primary and a secondary connector for processor cards. Figure 6 shows the locations of the connectors for the processor cards.

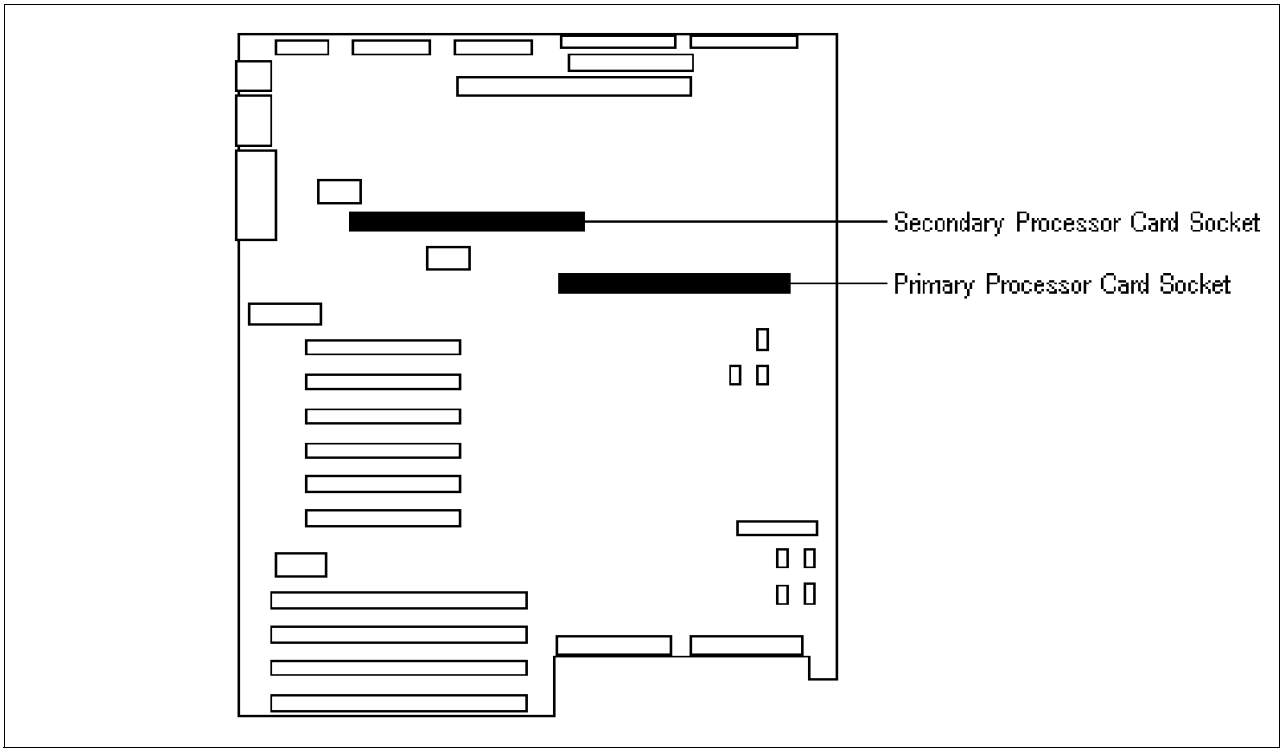


Figure 6. System Board Netfinity 7000

Every processor card contains two Zero Insertion Force (ZIF) sockets. Figure shows the locations of the ZIF sockets on the processor cards. The lower socket is *Socket #1* and upper socket is *Socket #2*. The ZIF sockets are compatible with Intel's Socket 8 specification. Each board may contain one or two processors, for a configurable range from one up to a total of four processors.

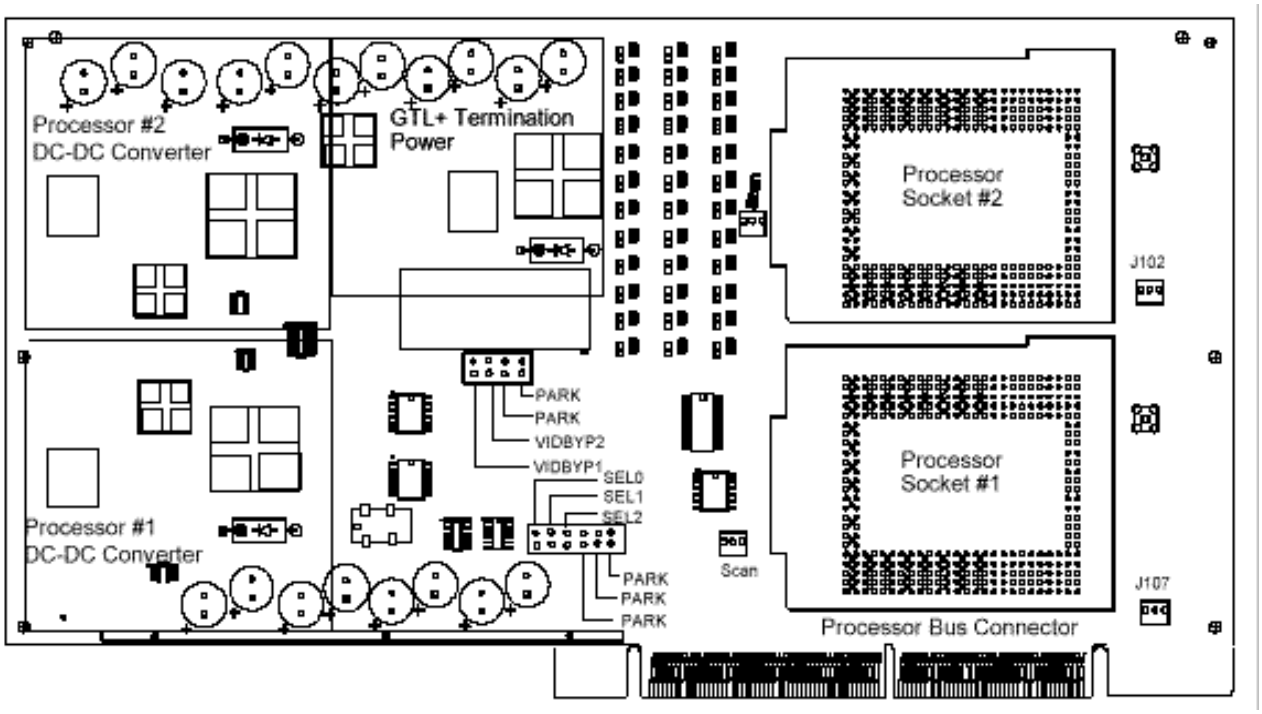


Figure 7. Processor Card Netfinity 7000

The population order is defined by the number of processors you want to install on the processor cards.

Table 5 shows the different supported population order for 1, 2, 3 or 4 processors. As example for a two-way processor system, one Pentium Pro processor must be installed on the socket #1 on the primary processor card and one on the socket #1 on the secondary processor card. Other processor configurations are not supported.

Table 5. Netfinity 7000 Processor Population Order

Number of Processors	Primary Processor Card		Secondary Processor Card	
	Socket #1	Socket #2	Socket #1	Socket #2
1	X			
2	X		X	
3	X	X	X	
4	X	X	X	X

Note

Normally you do not need to change any jumper settings on the processor cards for the processor upgrade. But if you upgrade a Netfinity 7000 Pentium Pro 200 MHz 512 KB second level cache model to a Pentium Pro 200 MHz 1 MB second level cache model then check and change the cache size jumper settings on the jumper block *J1C1* for both settings on the processor cards.

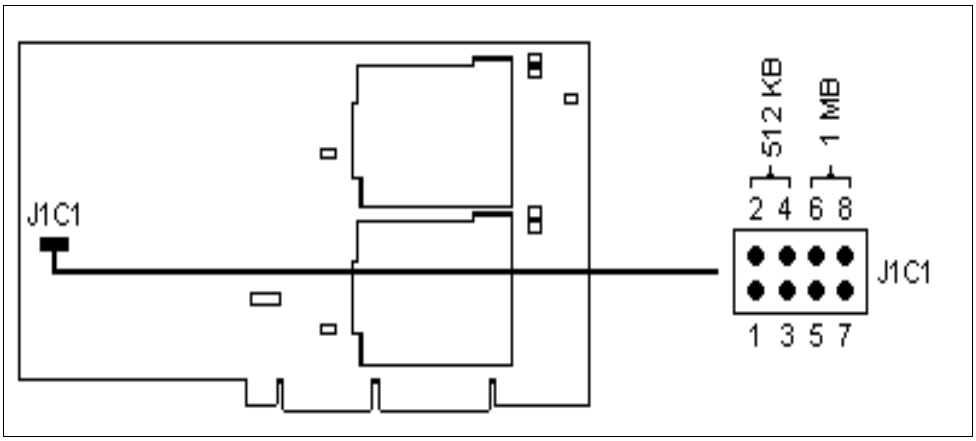


Figure 8. Processor Card Jumper Block J1C1

- 1-2 L2 Cache = 512 KB
- 3-4 L2 Cache = 512 KB
- 5-6 L2 Cache = 1 MB
- 7-8 L2 Cache = 1 MB

Requirements for the 200MHz/1MB

If you want to upgrade your 200MHz/512 KB models of Netfinity 7000 with the 200MHz/1MB upgrade kit (#94G7147), you may be reequired to replace the processor cards installed in the sysstem. Please check the FRU number on the current installed processor cards. If it is 12J3352, your server processor cards do not require this replacement. If the upgrade is reqwuired, you should order 1MB processor card options #94G7387 and replace both installed cards prior MHz/1MB processor.

2.4 RIBM Netfinity 7000 Memory Upgrade

The minimum main memory size for an SAP R/3 centralized or application server is 256 MB. A database server should minimally contain 512 MB. Your main memory configuration depends on your sizing recommendations.

The IBM Netfinity 7000 Server uses 60 ns, 168-pin, Error Correction Code (ECC), Dual-Inline Memory Modules (DIMMs).

The following characteristics apply to IBM Netfinity 7000 Server memory:

- Memory is installed on a memory card attached to the system board.

- The memory board contains four banks, arranged in 16 DIMM connectors and supports four-way memory interleaving. See Figure 9 for the location of the memory module banks and connectors on the memory board.
  - Bank 0 connectors J2, J3, J4 and J5
  - Bank 1 connectors J6, J7, J8 and J9
  - Bank 2 connectors J10, J11, J12 and J13
  - Bank 3 connectors J1, J15, J16 and J17
- Each bank contains connectors for four memory modules. Three memory-module kits are available: 256 MB, 512 MB and 1024 MB.
  - 256 MB Memory kit (4 x 64 MB DIMMs), part #94G7384
  - 512 MB Memory kit (4 x 128 MB DIMMs), part #94G7385
  - 1024 MB Memory kit (4 x 256 MB DIMMs), part #94G7386
- As a minimum, your server requires 64 MB memory modules in connectors J2, J3, J4, and J5 in bank 0.
- To ensure proper server operation, you must maintain 4, 8, 12, or 16 memory modules in your server.
- Up to 4 GB of memory can be installed in your server, with 256 MB memory modules in all 16 connectors (J2 through J17). You must remove the four 64 MB modules that come standard with the system.

Windows NT 4.0 Installation

Windows NT 4.0 will not install if you have more than 3 GB of memory installed in the system. You must first complete the installation with less than 3 GB of memory and install Windows NT Service Pack 3. After the service pack is installed, you can then install up to 4 GB of memory.

2.4.1 Memory Configuration Rules

Follow these rules when installing memory:

- All DIMMs modules installed in a bank must be the same speed and the same size.
- Different banks can have different sized DIMMs installed.
- The memory modules connectors must be filled in sequence, which means that you cannot use bank 0, leave bank 1 empty and use bank 3.
- The largest memory modules should be filled in the bank with the lowest number (bank 0) and next largest ones in the next bank and so one. As an example, if you have four 256 MB, four 128 MB and four 64 MB modules the 256 MB modules should be installed in bank 0, the 128 MB modules in bank 1 and the 64 MB modules in bank 2.

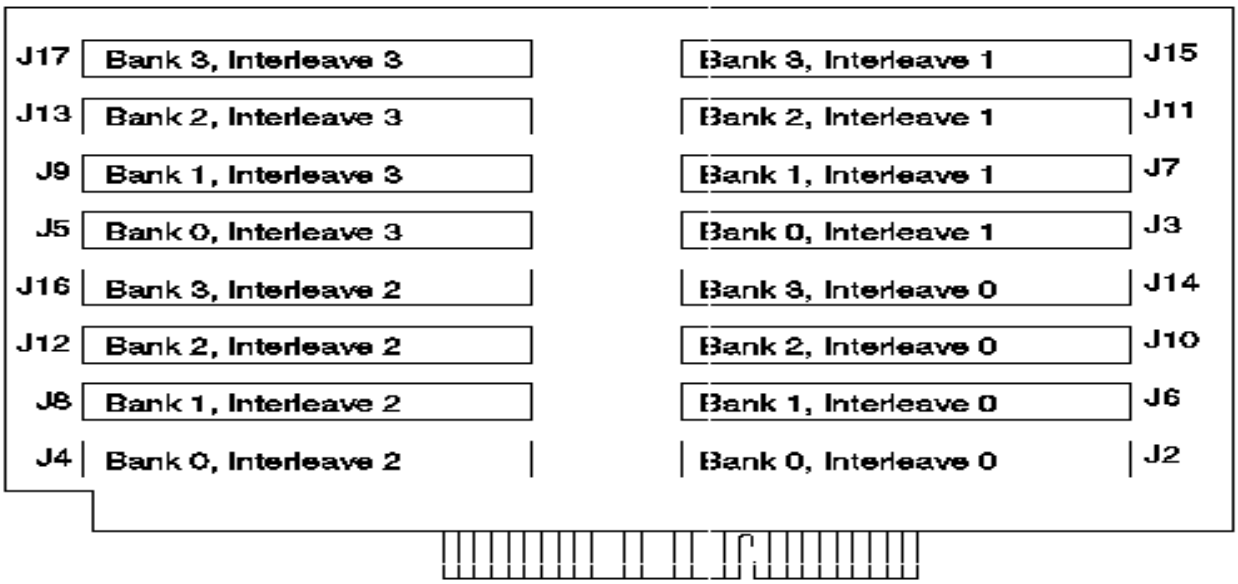


Figure 9. Memory Card Netfinity 7000

Table 6 gives examples of possible memory configurations.

Table 6. Some Acceptable Memory Configurations

System Memory	Bank 0	Bank 1	Bank 2	Bank 3
256 MB	64 MB DIMM X 4	None	None	None
512 MB	64 MB DIMM X 4	64 MB DIMM X 4	None	None
768 MB	128 MB DIMM X 4	64 MB DIMM X 4	None	None
1024 MB	128 MB DIMM X 4	64 MB DIMM X 4	64 MB DIMM X 4	None
1280 MB	256 MB DIMM x 4	64 MB DIMM X 4	None	None
1536 MB	256 MB DIMM x 4	64 MB DIMM X 4	64 MB DIMM X 4	None
2048 MB	256 MB DIMM x 4	128 MB DIMM X 4	64 MB DIMM X 4	64 MB DIMM X 4
2560 MB	256 MB DIMM x 4	256 MB DIMM X 4	64 MB DIMM X 4	64 MB DIMM X 4
3072 MB	256 MB DIMM x 4	256 MB DIMM X 4	256 MB DIMM X 4	None
3584 MB[1]	256 MB DIMM x 4	256 MB DIMM X 4	256 MB DIMM X 4	128 MB DIMM X 4
4096 MB[1]	256 MB DIMM x 4	256 MB DIMM X 4	256 MB DIMM X 4	256 MB DIMM X 4
Note: [1] For this configuration you have to remove the standard installed 256 MB 4 x 64 MB DIMM modules				

2.5 Installing Adapter Cards in the IBM Netfinity 7000

The Netfinity 7000 system board has six Peripheral Component Interconnect (PCI) bus slots for add-in boards. The PCI subsystem consists of two input/output (I/O) bus segments: a first PCI bus (PCI bus #0) and a second PCI bus (PCI bus #1). Both are independent PCI bus systems. Each is connected to the processor bus over its own host to PCI bridge. The first PCI bus connects the processor bus to three PCI connectors and a PCI to EISA bridge. The second PCI bus connects the processor bus to two embedded Ultra Fast/Wide SCSI controller and three PCI connectors. The system board has four Extended Industry Standard

Architecture (EISA) bus slots for add-in boards. EISA is fully backward-compatible with Industry Standard Architecture (ISA). You can install old or new ISA and EISA add-in boards in your server, which may save your older hardware investments. Figure 10 shows you a block diagram of the Netfinity 7000 system architecture.

.

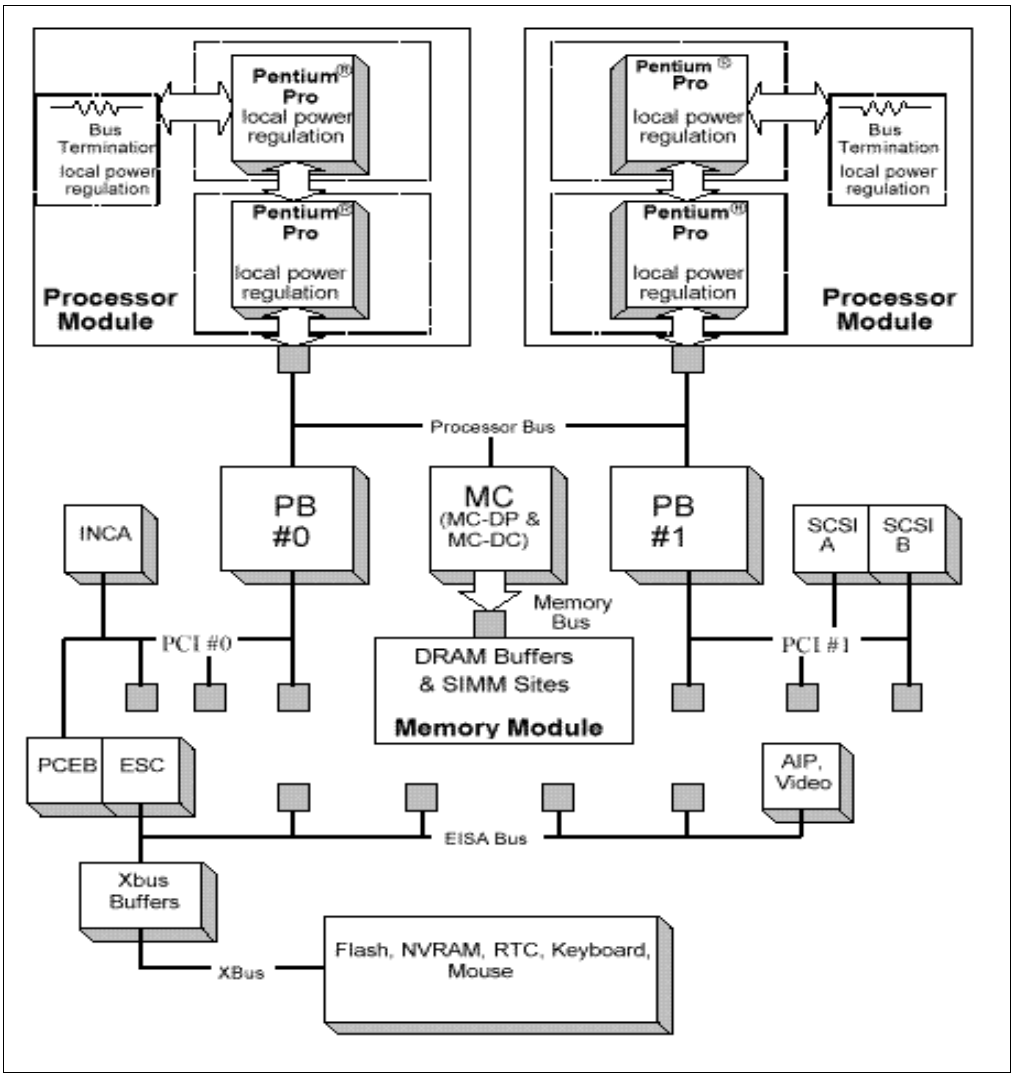


Figure 10. Netfinity 7000 System Architecture

2.5.1 Performance Recommendations

We recommend that you install an I/O-intensive adapter, such as RAID, and a network adapter in the second PCI Bus (PCI Bus #1), as the first PCI bus connects to a PCI to EISA bridge.

The PCI to EISA bridge controls the diskettes controller, serial and parallel interfaces, the Video Graphics Array (VGA) port and the Integrated Drive Electronics (IDE) port so you can achieve a little better performance if you install such an adapter in the second PCI bus.

Figure 11 shows the location of the PCI buses on the Netfinity 7000 system board. The PCI slots 4 to 6 are the expansion slots of the second PCI Bus.

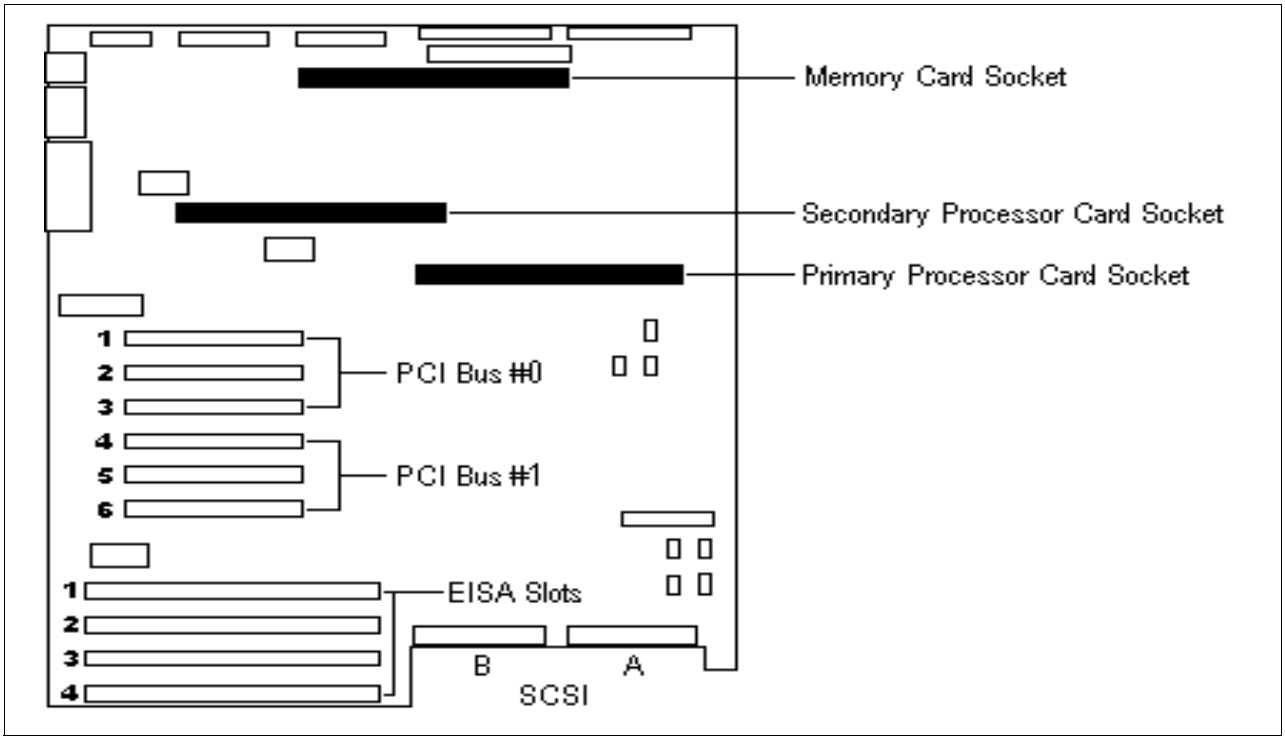


Figure 11. PCI Slots on the Netfinity 7000 System Board

But if you use multiple RAID or network adapters, then distribute every adapter over both PCI buses.

Two examples:

- One ServeRAID adapter and one network adapter
  - ServeRAID adapter, preferred slot 4
  - Network adapter, preferred slot 5
- Two ServeRAID adapter and one network adapter
  - First ServeRAID, adapter preferred slot 1
  - Second ServeRAID, adapter preferred slot 4
  - Network adapter, preferred slot 5

2.5.2 Boot Order Netfinity 7000

When the system boots, it will determine a boot device in a certain order. The system will then boot from the first bootable device it finds. A bootable device does not mean that there is an operating system installed. If a diskette is in the diskette drive without an operating system and the diskette drive has a higher priority in the boot order than another drive, the system will try to boot from the diskette. If there is no operating system on the diskette drive, the system will show an error message that it cannot boot.

That is also true for hard disk drives. If a hard disk drive connects to the on-board adapter and a hard disk drive connects to an additional hard disk controller in a PCI slot, and the priority of the on-board adapter is higher, then the system will always try to boot from the on-board adapter if an operating system is installed or not, unless you disable the boot capability of the on-board adapter (Disable BIOS). Then the status *bootable device* is removed from the device connected to the on-board adapter.

The only exception is the CD-ROM drive. If the boot option for the CD-ROM enabled and there is a boot CD-ROM in the CD-ROM drive the system will boot from this CD-ROM. If there is no boot CD-ROM in the CD-ROM drive, the system will take the next device in the bootable device order.

The following is the scan order in which the system will look for bootable devices:

1. Floppy Drive
2. IDE Drive
3. EISA bus slot 1
4. EISA bus slot 2
5. EISA bus slot 3
6. EISA bus slot 4
7. PCI Bus #0, slot 1
8. PCI Bus #0, slot 2
9. PCI Bus #0, slot 3
10. PCI Bus #1, slot 1
11. SCSI A (On-board AIC-7880 SCSI controller)
12. SCSI B (On-board AIC-7880 SCSI controller)
13. PCI Bus #1, slot 2
14. PCI Bus #1, slot 3

2.5.3 Multiple ServeRAID Controller

The Netfinity 7000 supports up to five ServeRAID II adapters. If you installed more than one ServeRAID adapter then the system will ask you the following question during the next boot process.

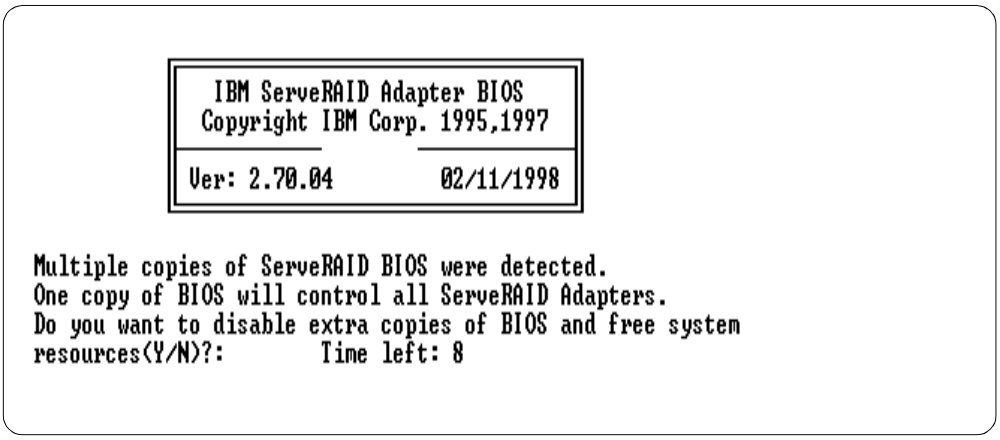

IBM ServeRAID Adapter BIOS
Copyright IBM Corp. 1995,1997
Ver: 2.70.04 02/11/1998
Multiple copies of ServeRAID BIOS were detected.
One copy of BIOS will control all ServeRAID Adapters.
Do you want to disable extra copies of BIOS and free system
resources(Y/N)?: Time left: 8

Figure 12. Disable Extra Copies of ServeRAID BIOS

There is a time counter running and you have 30 seconds to answer this question. Please answer here simply with **Y**.

The system will then disable the Basic Input Output System (BIOS) and release its system resources for every installed ServeRAID adapter except the BIOS of the ServeRAID adapter with the highest boot order priority. That is especially true in the case of the ServeRAID adapter and the Netfinity 7000 this one plugged in the PCI Slot with the lowest number. This is also the adapter where your operating system is booted.

For the highest boot order priority, see 2.5.2, “Boot Order Netfinity 7000” on page 37.

As the BIOS of the other ServeRAID adapters is disabled, you cannot boot from these adapters. Nor can you boot if there no hard disks are connected to the ServeRAID adapter with the remaining BIOS or if you remove this adapter. If you want to remove the ServeRAID adapter with the remaining BIOS and boot from another one or you want to install a ServeRAID adapter with disabled BIOS in another server, you have to reinstall the adapter BIOS.

This is done with the current *IBM ServeRAID and ServeRAID II BIOS flash update diskette*. To reload the BIOS code select only the option **Upgrade/Add BIOS - all adapters**. You do not need to select the option **BIOS and Firmware update**.

See 2.10.2, “ServeRAID BIOS and Firmware Update” on page 49 for the update procedure.

2.5.4 Network Interfaces and SAP R/3

The SAP R/3 systems requires various network communications between client and application server and application server and database server, depending on whether you use a *three-tier* or a *two-tier* solution. The transport protocol needed for SAP R/3 on Windows NT servers is TCP/IP.

The connection from the client to the application server can be established using a local area network (LAN) or a wide area network (WAN). All the different network types such as Ethernet, Fast Ethernet, token-ring, Fiber Distributed Data Interface (FDDI) and ATM, can be used, depending on your network structure needs, such as the number of clients and number of different locations, distance between the locations, etc.

To handle the communication traffic between the database server and the application servers for small configurations, 10 Mbps Ethernet or 16 Mbps Token-Ring Network Interface Card (NIC) should be sufficient. Larger configurations should use high speed links with FDDI or Fast Ethernet. We recommend that you always implement high-speed links with 100 Mbps Fast Ethernet or FDDI NICs for your configurations.

Select an appropriate Fast Ethernet switch which delivers the 100 Mbps collision-free and full-duplex to every of its network ports to exploit the 100 Mbps Fast Ethernet NICs in the database server and the application server. We don't recommend to use a 100 Mbps hub or switch which distribute the 100 Mbps bandwidth over all its network ports.

If you want to use an IBM S/390 as database server and your Netfinity 7000s as application servers you will need an FDDI NIC for the connection between the S/390 and the Netfinity 7000. The ESCON Channel is not supported yet.

2.5.5 Redundant Network Interface Cards

A high-end server system such as the Netfinity 7000 with all its high-availability features is useless if a single NIC fails. The server is running but not on the network and the users cannot work with it. Implementing multiple NICs in your SAP R/3 and database servers helps you to provide a higher level of availability and eliminate the NIC as a potential single point of failure. All IBM Netfinity models can operate with multiple network interface cards installed.

2.5.5.1 Duralink Failover

A particular solution to support an optimum availability for NICs is Adaptec's *Duralink Failover* integrated in their Fast Ethernet NICs. Duralink Failover is an ingenious software solution that helps deliver high-availability network connections.

The following NICs with this solution are supported in the Netfinity 7000:

1. Adaptec ANA-6911 single-port PCI Fast Ethernet adapter
2. Adaptec ANA-6944 four-port PCI Fast Ethernet adapter

Duralink Failover is a feature of the network device driver that monitors the network adapter and the network infrastructure status. When enabled, Duralink Failover monitors the network connection. In the event of a failure, it will move all existing network traffic to a standby NIC or port.

Duralink Failover is available with both Adaptec's single and four-port PCI Fast Ethernet adapters. With these adapters, a pair of identical ports are configured in the server. The two are designated as *primary* and *secondary*. With single port adapters, one is used as the primary port while another adapter must be installed to provide the secondary port. If the server were to employ Adaptec's four-port adapter, *Quartet*, for example, two ports may function as primary and the other two as secondary.

Regardless of the configuration, when a failure is detected on the primary port, Duralink Failover immediately disables the failed network port. Instantaneously, the secondary port is brought online to keep the server *up*. We call this sequence of events *failover*.

When failover occurs, SNMP traps are sent to network management stations and error logs are updated through the Windows NT event logger. If the primary adapter or port fails upon system boot, the system error log is updated and the secondary adapter or port is enabled.

When enabled, failover will take place as a result of any of the following server conditions.

- Link loss
- Watchdog timer expiration (a *keep-alive* mechanism the adapter uses to poll itself for proper operation)
- Abnormal hardware condition interrupt
- Abnormal send or receive counters, such as too many collisions or errors on the segment

2.6 Installing Internal Hard Drives in the IBM Netfinity 7000

You can install 12 hot-swap hard drives in a Netfinity 7000. The hot-swap capability is realized through two hot-swap *backplanes* in the Netfinity 7000. Each of the two backplanes connects six hot-swap slimline hard drives. These backplanes use the industry standard 80 pin Single Connector Attach (SCA) to connect the Ultra/Wide SCSI II hard drives.

Every SCSI device on a SCSI bus needs a unique SCSI ID. The SCSI hard-disk drives in the Netfinity 7000 get their SCSI IDs from the hot-swap backplane. On every backplane is a SAF-TE Enclosure Processor integrated which sends and receives SAF-TE system management commands across the SCSI bus. This information are about the status of the hard drives. As the SCSI controller and backplanes are SCSI devices they require a SCSI ID as well.

Each Netfinity 7000 backplane is connected to each of the two on-board SCSI adapters. If you want to connect a ServeRAID adapter to these backplanes you only have to remove the 16-bit SCSI cables from the on-board adapters and connect these to the ServeRAID adapter. You can connect both backplanes to one or two channels of the ServeRAID adapter. Due to performance reasons we recommend to distribute the hard drives over several ServeRAID channel.

But if you want to connect the both backplanes to one ServeRAID adapter channel or one on-board adapter Ultra/Wide channel you will need a *Backlane Repeater Kit* part #94G7426. It contains two repeater cards and a SCSI cable to connect the backplanes and ServeRAID adapter together. The repeater cards will be connected to every backplane. They ensure the SCSI signal quality so it is possible to use the Wide Ultra SCSI transfer mode for daisy-chained backplanes.

In the case where you use two backplanes at one SCSI channel you have to change some settings on the backplanes for the SCSI-IDs and termination. The option jumper block J10, located on every backplane, determines these settings. There are default no jumpers on the jumper block installed.

Do the following settings to prepare the backplanes for daisy chaining.

1. Disable the termination on the backplane connected at the middle SCSI cable connector by installing a jumper on the pins 3-4 of the jumper block J10.
2. Change the SCSI ID settings for the other backplane connected at the last SCSI cable connector (end of the SCSI bus) by installing a jumper on the pins 5-6 of the jumper block J10, so that all devices get a unique SCSI ID.

Table 7 and Table 8 show the settings for the backplane jumper block *J10.*

Table 7. Backplane Option Jumper Block (J10)

Pins	Description
1-2	Reserved.
3-4	Placing a jumper on these two pins disables SCSI terminator for optional SCSI repeater card.
5-6	Placing a jumper on these two pins enables SCSI IDs 8-D.
7-8	Reserved.
9-10	Reserved.
11-12	Placing a jumper on these two pins reverses the SCSI IDs on the backplane.
Note: No jumpers are default installed on the J10 jumper block.	

Table 8. SCSI ID Settings on Jumper Block (J10)

J10 Pins 5-6	J10 Pins 11-12	SCSI ID Bay 1	SCSI ID Bay 2	SCSI ID Bay 3	SCSI ID Bay 4	SCSI ID Bay 5	SCSI ID Bay 6	SCSI ID Backplane
no jumper[1]	no jumper[1]	0	1	2	3	4	5	15
no jumper	jumper	5	4	3	2	1	0	13
jumper	no jumper	8	9	10	11	12	13	14
jumper[2]	jumper[2]	5	4	3	2	1	0	15

Note:

[1] This is the default jumper setting.

[2] This combination is not supported.

Refer to *IBM PC Server Technology and Selection Reference,* SG24-4760 for additional information.

2.7 Installing External Hard Drives in the EXP10

You can install ten half-high or slimline hard drives in an EXP10 storage expansion unit. The EXP10 has four SCSI ports and can be divided in two SCSI buses. In this way you can build two SCSI buses, each with up to five hard drives or one SCSI bus with up to ten drives on it. It is not allowed to connect two or more EXP10 together. The EXP10 contains also backplanes for the SCSI ID distribution.

Figure 13 shows the front of the EXP10 and the SCSI IDs of the hard drive bays. The SCSI ID assignment can be changed with switch settings. There is usually no need to change the SCSI settings. Please refer to your user manual or the redbook *IBM PC Server Technology and Selection Reference,* SG24-4760 for additional information.

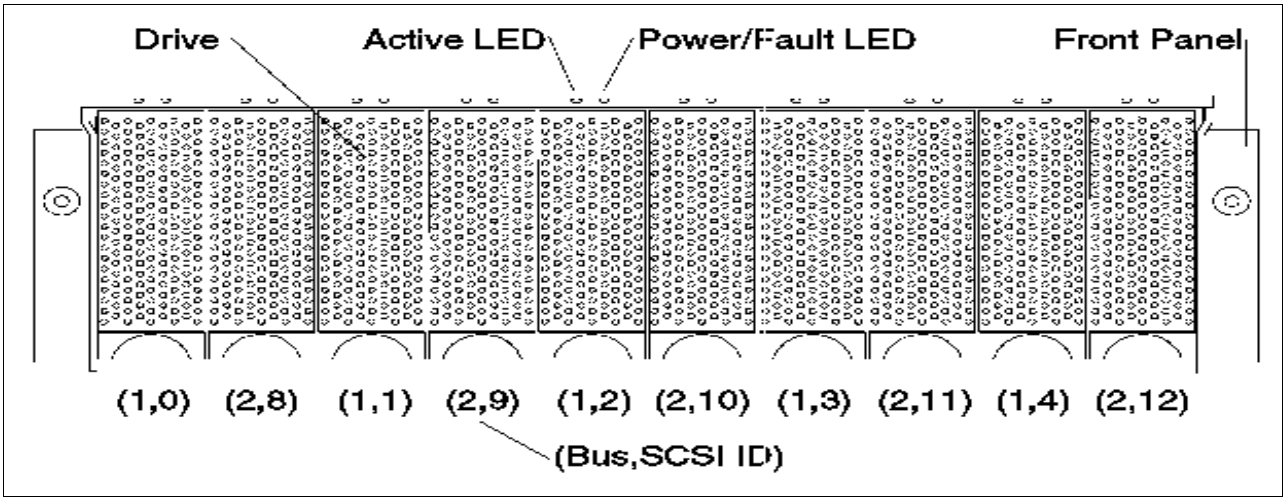


Figure 13. EXP10 Bay SCSI ID Assignments

The EXP10 already integrates a SCSI signal repeater to support Wide Ultra SCSI mode with external cable lengths up to 2 meters. Figure 14 shows the rear of the EXP10.

To configure a Netfinity EXP10 as a single 10 drive SCSI channel, one external SCSI cable is attached from the SCSI adapter to the SCSI bus 1 IN connector in the unit. The 0.4 meter internal cable provided in the ship group is connected to the SCSI bus 1 OUT and the SCSI bus 2 IN connectors of the unit. The external terminator is then installed on the SCSI bus 2 OUT.

When configuring a Netfinity EXP10 with both buses independent of each other, one external SCSI cable is attached from the SCSI adapter to the SCSI bus 1 IN connector on the unit. A second external SCSI cable is attached from another SCSI adapter connector in the same or a different server to the SCSI bus 2 IN connector in the unit. The SCSI bus 1 OUT and the SCSI bus 2 OUT connectors must have an external SCSI terminator attached. The Netfinity EXP10 ships with one terminator, so another terminator (part #32G3918) must be ordered to support this configuration.

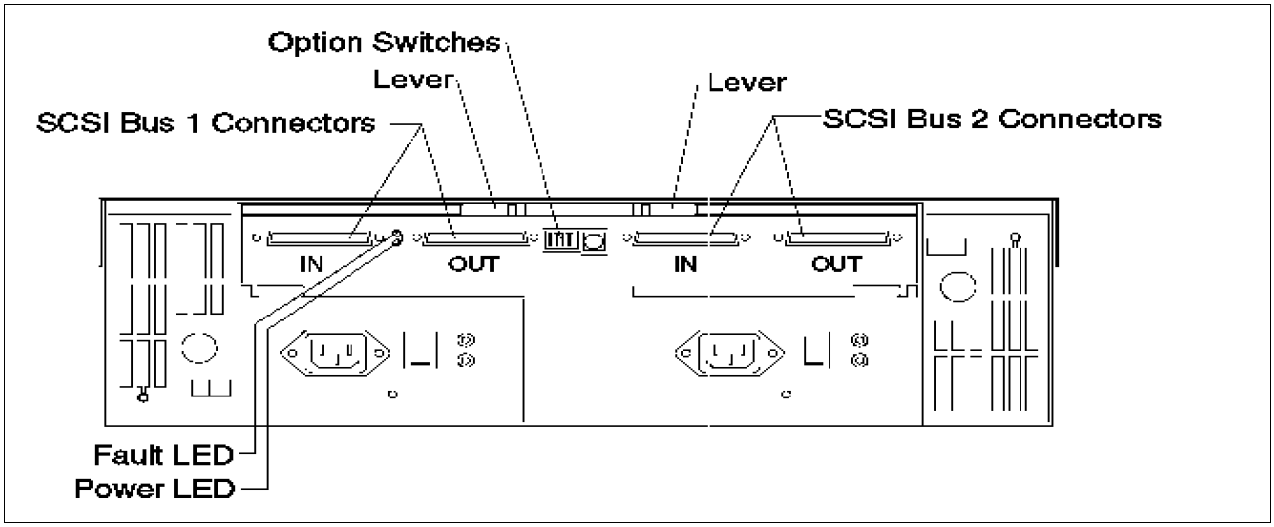


Figure 14. Rear of the IBM Netfinity EXP10 Storage Expansion Unit

We would prefer the configuration with two SCSI buses when the EXP10 is connected to the database server. You can distribute ten hard disk drives over two SCSI channels. The ServeRAID adapter supports RAID arrays over several channels and already has two external ports. You can also use the third ServeRAID channel for external SCSI expansion units. This is provided by the option: IBM Third Channel Cable, part #76H5400.

The following cables are used to attach the ServeRAID adapter to the EXP 10:

- IBM 1M External .8mm SCSI Cable, part #76H3589
- IBM 2M External .8mm SCSI Cable, part #01K8027
- IBM 3M External .8mm SCSI Cable, part #01K8028
- IBM 4.3M External .8mm SCSI Cable, part #01K8029

Limitations of the new 9.1 GB 10K rpm drives

The Netfinity EXP10, will only support a total of 8 x 9.1 GB 10K rpm HDDs (specifically, part number 01K7968). IBM will support mixed configurations of these drives.

A flyer will be included with this drive option that specifically recommends to the customer that the middle two slots be populated with the dummy trays. The middle two slots run hottest and so should be left with the dummy trays only. Whatever the mixed configuration is, when even a single 9.1 GB 10K rpm drive (01K7968) is included in this configuration the maximum number of drives supported in the Netfinity EXP10 is eight.

This is a power consumption issue. If a customer installs nine or ten of these HDDs, the customer will lose redundancy. Both power supplies in this case will be operating at 60% capacity. With both operational, the customer will not experience any problems. However, should one power supply fail, the remaining power supply will not be able to maintain the necessary power, a breaker will trip and the system will shut down.

2.8 IBM Netfinity 7000 Video Subsystem

The system board has an on-board integrated Cirrus Logic CL-GD5424 super VGA controller connected to PCI to EISA bridge and comes standard with 1 MB of on-board video memory. The video memory is not upgradable.

An older system board revision was shipped in the Netfinity 7000 with only 512 KB of video memory. There is an upgrade socket for video memory on this system board. If you have such an older system you can optionally expand the on-board video memory buffer size to 1 MB by adding one 40-pin 256 KB x 16, 70 nano seconds (ns) fast-page Dynamic Random Access Memory (DRAM). Figure Table 9 shows you a list of possible DRAM modules.

Table 9. Video Memory Upgrade for Older Netfinity 7000 System Boards

Manufacturer	Part Number	DRAM Type	Size
Mitsubishi	M5M44260AJ-7-T10 OR -6	256KBx16	512KB
Samsung	KM416C256AJ-6T	256KBx16	512KB
Samsung	KM416C256BLJ-7T OR -6	256KBx16	512KB
Samsung	KM416C256BJ-6T	256KBx16	512KB
Hyundai	HY514260BJC-60 TAPE/REEL	256KBx16	512KB
NEC	UPD424260LE-70 ITR OR -60	256KBx16	512KB
Hitachi	HM514260AJ-7T OR -6	256KBx16	512KB
Note: These part numbers are not IBM part numbers			

Manufacturer	Part Number	DRAM Type	Size
Fujitsu	MB814260-7-PJRD OR -60	256KBx16	512KB
Toshiba	TC514260BJ-70 OR -60	256KBx16	512KB
Micron	MT4C16257DJ-7TR OR -6	256KBx16	512KB
Oki	MSM514260A-70JSTR	256KBx16	512KB
Hyundai	HY514260BJC-70 TAPE/REEL	256KBx16	512KB
Siemens	HYB514171BJ-70	256KBx16	512KB
Siemens	HYB514171BJ-70 TAPE/REEL	256KBx16	512KB
Samsung	KM416C256BJ-7T OR -6	256KBx16	512KB
Samsung	KM416C256AJ-7T OR -6	256KBx16	512KB
		256KBx16	512KB
		256KBx16	512KB

Note: These part numbers are not IBM part numbers

The following list shows the supported graphic modes in NT with 512 KB and 1 MB Video Memory.

- Systems with 512 KB Video Memory
  - 640x480 16 colors at 60, or 72 Hertz refresh rate
  - 640x480 256 colors at 60, or 72 Hertz refresh rate
  - 800x600 16 colors at 56,60 or 72 Hertz refresh rate
  - 1024x768 16 colors at 60 or 72 Hertz refresh rate

The following list shows the supported graphic modes in NT with 1 MB Video Memory:

- Systems with 1MB Video Memory
  - 640x480 256 colors at 60, or 72 Hertz refresh rate
  - 640x480 65536 colors at 60, or 72 Hertz refresh rate
  - 800x600 256 colors at 56,60, or 72 Hertz refresh rate
  - 1024x768 256 colors at 43 (interlaced),60,70 or 72 Hertz refresh rate
  - 1280x1024 16 colors at 43 (interlaced) refresh rate

2.8.1 Additional Graphic Adapters

The BIOS will *automatically* disable the on-board video if another add-in video adapter is installed into the system baseboard.

Note

However, the BIOS will only support add-in video adapters in the first PCI bus (slots one to three). Video adapters placed in the second PCI bus (slots four to six) will not be recognized.

You will find information about supported graphic adapters on the compatibility list on the World Wide Web at http://www.us.pc.ibm.com/serverproven.

2.9 IBM Netfinity 7000 Power and Cooling

The IBM Netfinity 7000 Server chassis is divided in two parts. The upper part contains the system board and its components. Three hot-swap cooling fans provide cooling redundancy, which means that the server can continue to operate even if a fan fails. Nevertheless, the failing hot plug fan should be replaced as soon as possible to regain the cooling efficiency and maximum reliability.

The chassis part below contains the power components, the hot-swap drive bays, the backplanes and the expansion bays. The cooling there is provided by cooling fans attached to the hot-swap power supplies.

The Netfinity 7000 comes standard with two 400 watt hot-swap power supplies to support full configurations. Operating the Netfinity 7000 with only one power supply is not allowed.

The optional IBM Netfinity 400 watt Hot-Swap Redundant Power (#94G7150) can be added to allow the IBM Netfinity 7000 Server to operate without interruption if one of the two standard power supplies fails. The replacement of the failing power unit (easily removed and reinstalled) will be possible without powering down the server.

When three power supplies are installed in the system, the power load is shared across all three sources. You won't need any additional power cables.

2.10 BIOS and Firmware Level

It is important to apply the latest firmware and BIOS updates. This can help you to save a lot of time wasted searching for errors and fixing problems. See the driver and update list in 2.1, "Drivers and Updates" on page 17 for the drivers, BIOS and firmware revisions that are required during this installation.

2.10.1 Netfinity 7000 System BIOS Update

During the boot process, the current BIOS version installed on your Netfinity 7000 is shown on the screen in the upper left corner and on the front panel display. You can also check it with the System Configuration Utility (SCU). The SCU can be started from the Netfinity 7000 System CD-ROM or from the SCU diskette.

For example, the current Netfinity 7000 BIOS Version 14 is shown as:

```
AMIBIOS (C)1992 American Megatrends, Inc.
BIOS Version 1.00.14.CD0
```

The BIOS upgrade also provides new BIOS versions for the on-board Ultra Fast/Wide SCSI controller.

If your Netfinity 7000 needs the BIOS update, then do the following steps to update the system BIOS.

Note: Please read the README file on the Netfinity 7000 BIOS flash update diskette.

1. Unpack the downloaded Netfinity 7000 BIOS flash update diskette image file to a diskette.
2. Make sure you have recorded any setup or SCU changes you may have made before you do the BIOS update.
3. Insert the diskette in your floppy diskette drive and ensure that the diskette is not write protected.
4. Reboot the server from the floppy drive.
5. The system shows a list of options:
   - Option 1 is to update the system BIOS only.
   - Option 2 is for an interactive version of the BIOS update utility.
   - Option 3 is to update the system along with the SCSI tables.
6. Enter 3 at command prompt and press Enter.
7. Follow the instructions on the screen to finish the update.
8. When the update has completed the system will automatically reboot. Don't remove the floppy diskette from the drive.
9. Check to make sure the BIOS version is the new version when the system reboots.
10. Press F1 to execute the system setup utility.
11. In the setup utility press F5 to reset the system register and load setup default values.
12. While in setup restore any settings that you made prior to the BIOS update.
13. Press F10 and Enter to save your settings and exit the setup utility.
14. The system will reboot. Boot again from the flash update diskette.
15. When the system boots after the flash update you will see the following message during the Power On Self Test (POST):

```
IBM Netfinity 7000

     Model number = ------- Serial number = -------
```

    This is the Virtual Product Data (VPD) message. The dashes indicate that the model and serial number information have not been entered.

16. Enter the following command:

```
A:>ADDVPD /B:sssssssss /M:8651fff
```

In the above command put the 7-digit serial number where the s's are and the 3-digit feature number where the f's are (along with the 8651 model number). This information is located on the serial number label on the front cover.

17. At the next boot the POST will display the VPD banner with the information you enter.

2.10.2 ServeRAID BIOS and Firmware Update

Two updates are available for the ServeRAID adapter: a BIOS and a firmware update. The ServeRAID BIOS implements system functions and system programs and is the interface to the system. The ServeRAID firmware on the adapter controls the integrated IBM PowerPC 403 processor and implements the RAID capabilities. The firmware is so to speak the operating system of the adapter.

The BIOS and firmware updates are located on a single diskette.There are three revisions of the ServeRAID adapters: the ServeRAID with one external SCSI port, the PC Server 330 on-board single channel ServeRAID, and the ServeRAID II with two external SCSI ports. The current valid BIOS and firmware versions depend on your adapter but all adapters are provided with a flash utility. The flash utility detects automatically your adapter revision and applies the right update.

Note: Only the ServeRAID II adapter is supported in the Netfinity 7000.

You can check your current installed BIOS and firmware version during the system boot. In the following example, the BIOS is Version 2.70.04 and the Firmware is Version 2.70.08.

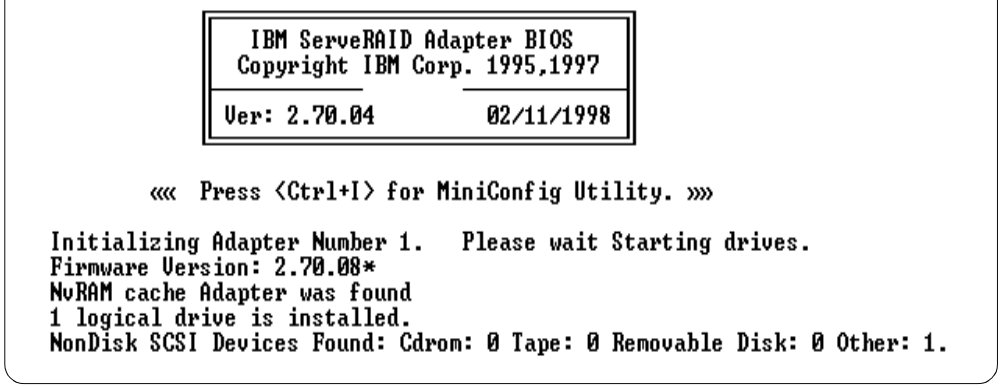

IBM ServeRAID Adapter BIOS
Copyright IBM Corp. 1995,1997
Ver: 2.70.04
02/11/1998
«« Press <Ctrl+I> for MiniConfig Utility. »»
Initializing Adapter Number 1. Please wait Starting drives.
Firmware Version: 2.70.08*
NvRAM cache Adapter was found
1 logical drive is installed.
NonDisk SCSI Devices Found: Cdrom: 0 Tape: 0 Removable Disk: 0 Other: 1.

Figure 15. BIOS and Firmware ServeRAID Adapter

Do the following steps to update your ServeRAID adapter.

Note: Read the README file on the ServeRAID and ServeRAID II BIOS/Firmware flash update diskette.

1. Unpack the downloaded IBM ServeRAID and ServeRAID II BIOS/Firmware flash update diskette image file to a diskette.
2. Insert the diskette in your floppy diskette drive and reboot the server.
3. The following menu appears:

```
IBM DOS 6.1 Startup Menu
 ========================

    1. ServeRAID II, BIOS and FIRMWARE update
    2. ServeRAID II, BIOS update only
    3. ServeRAID II, FIRMWARE update only
    4. ServeRAID II, upgrade/add BIOS - all adapters
    5. ServeRAID II, upgrade/add BIOS to first adapter

 Enter a choice:
```

4. Select choice **1. ServeRAID II, BIOS and FIRMWARE update** to update the BIOS and the firmware on all installed ServeRAID adapters in your system.
5. Follow the instructions that appear on the screen.

After the upgrade, restart your system.

2.10.3 Hard Disk Drive Update

You will need hard disk firmware updated to level 63 for 9.1 GB and 4.51 GB IBM hard drives.

This update is for the following hard drives:

- The 4.5 GB 80 Pin SCSI Hard Disk Drive FRU p/n76H5817
- The 4.5 GB 80 Pin SCSI Hard Disk Drive FRU p/n01K6675
- The 9.1 GB 80 Pin SCSI Hard Disk Drive FRU p/n76H5818
- The 9.1 GB 80 Pin SCSI Hard Disk Drive FRU p/n01K6679
- The 4.5 GB 68 Pin SCSI Hard Disk Drive FRU p/n76H2697
- The 9.1 GB 68 Pin SCSI Hard Disk Drive FRU p/n76H2698
- The 4.5 GB 68 Pin SCSI Hard DISK Drive FRU p/n93G2970
- The 9.1 GB 68 Pin SCSI Hard DISK Drive FRU p/n93G2972
- The 4.5 GB 50 Pin SCSI Hard Disk Drive FRU p/n76H2695
- The 9.1 GB 50 Pin SCSI Hard Disk Drive FRU p/n76H2696

When booted the update diskette will search for the suspect drives, and immediately flash the firmware of the hard disk drives requiring this update.

The following procedure updates the affected hard drives.

Note: Please read the README file on the PC Server and Netfinity 4.5 / 9.1 GB hard drive update diskette.

1. Unpack the downloaded PC Server and Netfinity 4.5 / 9.1 GB hard drive update diskette image to a diskette.
2. Ensure that all connected external expansion units are powered on.
3. Insert the diskette in your floppy diskette drive and reboot the server.
4. The following menu appears.

```
1. Update drives attached to the PCI Adaptec SCSI Controllers
2. Update drives attached to a single ServeRAID or ServeRAID II Adapter
3. Update drives when there are 2 ServeRAID II Adapters installed
4. Update drives attached to the IBM F/W PCI-Bus RAID Adapter
5. Update drives attached to the IBM F/W Streaming RAID (Micro Channel)
6. Check drives attached to the 704 Mylex PL Raid Adapter

Enter a choice:
```

5. Select choice **2. Update drives attached to a single ServeRAID or ServeRAID II Adapter** if only one ServeRAID adapter is installed in your system and choice **3.3. Update drives when there are 2 ServeRAID II Adapters installed** for two ServeRAID adapters.

   Note: If there are three or four ServeRAID adapters installed in the system then execute the following procedure:

   a. When the system boots and asks which adapter to use, select choice **2. Update drives attached to a single ServeRAID or ServeRAID II Adapter**.

When you see the question `Would you like to proceed (Y/N)?`, answer **N**.

   a. At the A:> prompt, if there are three ServeRAID II adapters installed, type in `3serv` and with four ServeRAID adapters installed type in `4serv` and press Enter.

6. Follow the instructions that appear on the screen.
7. When this update is complete, power cycle the server and any SCSI external expansion units.

2.11 Configurating the Advanced System Management Adapter

The Advanced System Management Adapter (ASMA) is an ISA card and you must determine which system resources are used by it. For that purpose you must run the ASMA configuration utility. These resources must be made known to the system with the Netfinity 7000 System Configuration Utility (SCU).

As the Advanced System Management Adapter is standard in the Netfinity 7000, the card is already configured. But we recommend that you check the settings to avoid conflicts with additional adapter cards installed and ensure that the adapter properly works.

1. Insert the ASMA configuration update utility and device driver diskette in the floppy disk drive. The utility program writes an SM.INI file to the diskette. This file is used during the device driver installation in Windows NT. Make sure the diskette in the floppy disk drive is not write protected.
2. Reboot your system.
3. The utility is automatically loaded from the diskette.

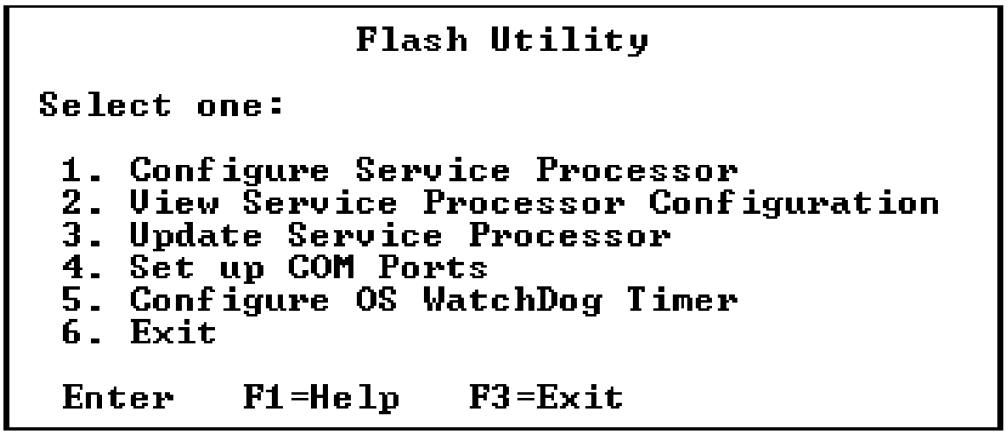


Figure 16. Main Menu ASMA Configuration Utility

4. Select **1. Configure Service Processor**.
5. Select **port address 200h** and **interrupt 5.**
6. Check your settings by selecting **2. View Service Processor Configuration**.
7. Select the **port 200h** again.
8. The adapter should respond with the configured interrupt and port address.

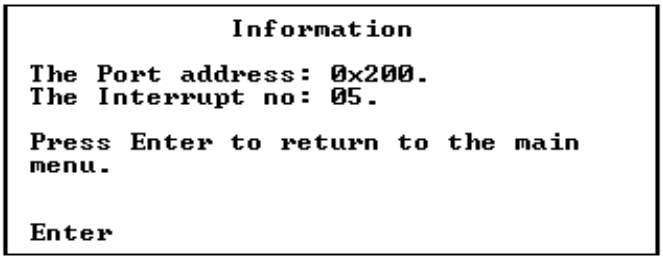


Figure 17. View Service Processor Configuration

9. Select **3. Update Service Processor** to update the Service Processor Firmware. The firmware upgrade will not work properly if the steps above were not done successfully.
10. Follow the instructions to finish the update.
11. Then Select **5. Configure OS Watchdog Timer** and select **1. Enable WatchDog** to enable the Watchdog timer.
12. Press F3 to exit the watchdog menu.
13. Select **6. Exit** to leave the program.
14. Remove the diskette from the floppy disk drive and reboot the system.

If you are not able to complete the steps and configure the adapter or step 2, View Service Processor Configuration, failed or you have any other problems with the adapter, then you should reset the adapter and clear the configuration.

1. Power off and open the server.
2. Remove the adapter.

3. Remove the battery from the adapter and set it aside.
4. Carefully short the battery contacts together with a small paper clip or a small metal screwdriver for 5-10 seconds. This resets the adapter and clears the configuration.
5. Reinstall the battery on the adapter.
6. Reinstall the adapter.

After you reset the adapter and clear the configuration, or replace the battery, you must reconfigure the adapter as described above.

ASMA COM Ports - Important

The COM ports on the Advanced Systems Management Adapter cannot be configured for use by the system. Please disregard the information regarding serial port sharing found in the Service Processor and Adapter COM Port Configuration section of the Advanced Systems Management Adapter Installation Instructions publication.

The adapter comes configured with adapter ports disabled. Leave the settings for ports COM A and COM B disabled in the adapter configuration program to prevent the system from accessing them. COM B is dedicated to the adapter and you can use all adapter features over this port. You cannot use the ports as additional serial interfaces for the system.

The ASMA configuration must now be entered in the System Configuration Utility. This is covered in 2.12, “IBM Netfinity 7000 System Configuration Utility” on page 53.

2.12 IBM Netfinity 7000 System Configuration Utility

The System Configuration Utility (SCU) is the main tool to configure the system or to check or change the configuration. Most system settings can be entered from either the SCU or BIOS Setup, but the SCU provides conflict resolution as well as access to information about ISA, EISA, and PCI adapters.

It is possible to start the SCU from the Netfinity 7000 System CD-ROM or from the System Configuration Diskette. The Netfinity System CD-ROM and the System Configuration Diskette are bootable.

1. Insert the System CD-ROM in the CD-ROM drive or the System Configuration Diskette in the floppy drive and reboot your system.
2. If you boot from the SCU CD-ROM you will get the following screen.

```
PC DOS 7.0 Startup Menu

   1. Run System Configuration Utility
   2. Run IBM Netfinity 7000 Diagnostics
   3. Run ServeRAID Configuration
   4. Create IBM Adv. Sys. Management Adapter Configuration Diskette
   5. Create SCO Device driver Diskettes

Enter a choice: 1       Time remaining: 20
```

Figure 18. System Configuration Utility CD Boot Menu

a. Choose **1. Run System Configuration Utility**

a. Reply to the next two questions with **N**.

3. If you boot from the SCU Diskette then select **1. Execute AMISCU** in the following menu.

```
PC-DOS Startup Menu
-------------------

1. Execute AMISCU
2. Execute AMISCU For System With PNP OS

Enter a choice:
```

Figure 19. System Configuration Utility Disk Boot Menu

4. The SCU will start and show you the SCU main menu.

```
SYSTEM CONFIGURATION UTILITY, Release 3.61, (C)1995-96 American Megatrends Inc.

        Step 1: About System Configuration

        Step 2: Add and Remove Boards

        Step 3: Change Configuration Settings

        Step 4: Save Configuration

        Step 5: View Switch/Jumper Settings

        Step 6: Exit

[Select=ENTER]  [Exit=ESC]  [Help=F1]  [Utilities=F9]
```

Figure 20. System Configuration Utility Main Menu

2.12.1 SCU Settings for the ASMA Card

The Netfinity 7000 server requires a configuration file to configure ISA or EISA adapters. The configuration file for the ASMA card is located on the System CD-ROM and the System Configuration Diskette. The file is automatically recognized through the SCU. The following steps depend on whether your adapter was already entered in the SCU program or not.

1. At the SCU program main menu screen, select **Add and Remove Boards.**
2. Enter the Administrator password if defined; otherwise, press Esc.
3. You will see a list with the installed adapters in your system.

Figure 21 shows an Advanced System Management Adapter installed in EISA Slot 1.

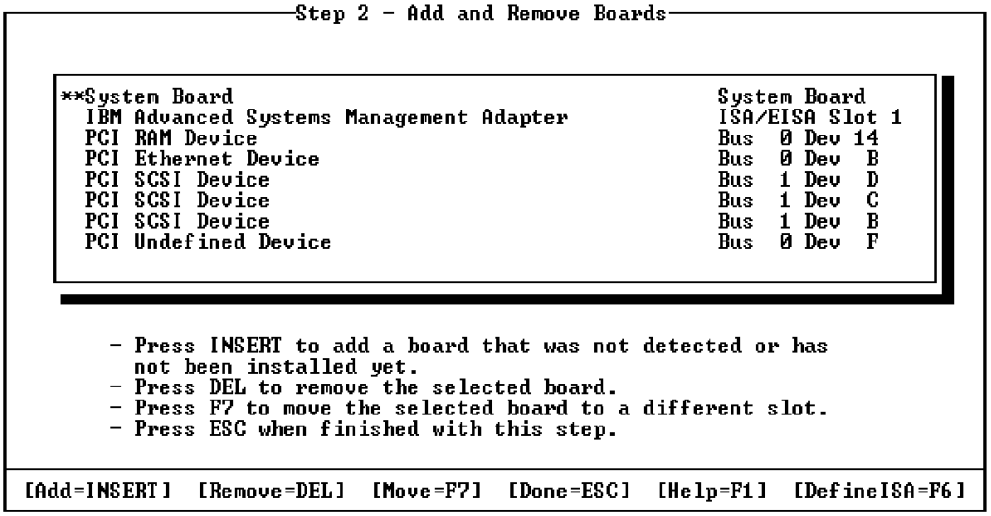

Step 2 - Add and Remove Boards
**System Board
System Board
IBM Advanced Systems Management Adapter
ISA/EISA Slot 1
PCI RAM Device
Bus 0 Dev 14
PCI Ethernet Device
Bus 0 Dev B
PCI SCSI Device
Bus 1 Dev D
PCI SCSI Device
Bus 1 Dev C
PCI SCSI Device
Bus 1 Dev B
PCI Undefined Device
Bus 0 Dev F
- Press INSERT to add a board that was not detected or has not been installed yet.
- Press DEL to remove the selected board.
- Press F7 to move the selected board to a different slot.
- Press ESC when finished with this step.
[Add=INSERT] [Remove=DEL] [Move=F7] [Done=ESC] [Help=F1] [DefineISA=F6]

Figure 21. SCU Add and Remove Boards

4. If there a list entry with the IBM Advanced System Management Adapter in the proper slot, press Esc to go back to the system configuration utility program main menu.
5. If there a list entry with the ASMA card in the wrong slot, select the ASMA card, press F7 and select the correct EISA slot where the adapter is installed. Then press Esc to go back to the system configuration program main menu.
6. If there no entry for the ASMA card, do the following:
   a. Press Insert to add an entry.
   a. The ASMA EISA CFG-File is on the Netfinity System CD-ROM or the SCU diskette and is shown in the following screen. Select in the list for EISA CFG-Files the **IBM Advanced System Management Adapter**.

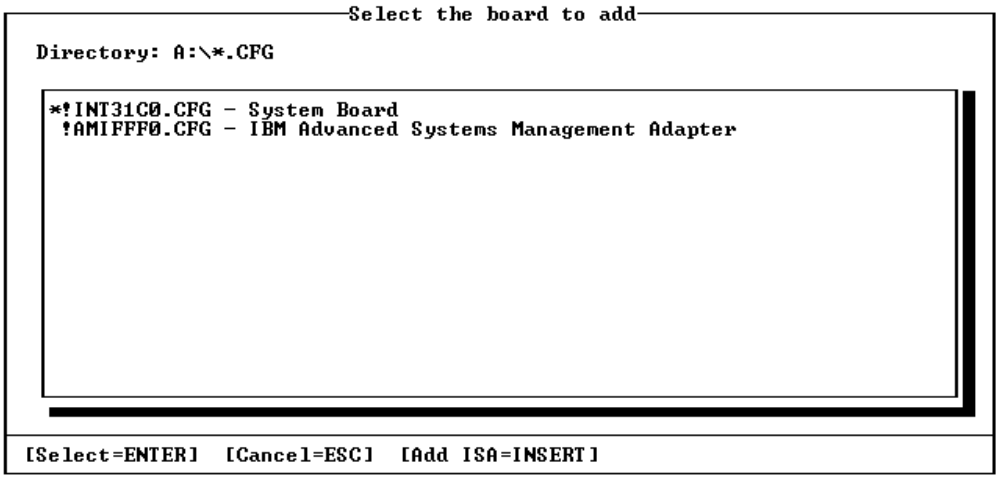

Select the board to add
Directory: A:*.CFG
*!INT31C0.CFG - System Board
!AMIFFF0.CFG - IBM Advanced Systems Management Adapter
[Select=ENTER] [Cancel=ESC] [Add ISA=INSERT]

Figure 22. ASMA EISA Config File

a. Then select the EISA slot where the adapter is installed.

a. Press Esc to go back to the system configuration program main menu.

7. You do not have to change the Configuration Settings. The ASMA card is automatically set to port 200h and interrupt 5 in the SCU.

2.12.2 SCU Settings for the NT Installation

Please check the following settings before you install Windows NT on the Netfinity 7000.

1. At the SCU program main menu screen, select **Change Configuration Settings**.
2. Select **System Board** and press Enter. You will get a list with all configuration settings for your system.
3. Ensure that the entry MP Spec Version is set to **MP Spec V1.4**.

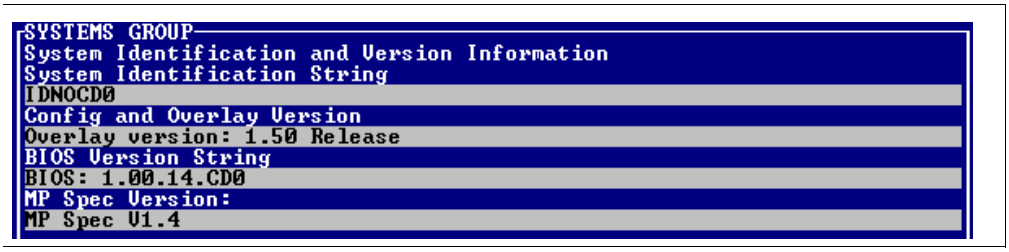


Figure 23. BIOS Release and MP Level

4. Set the entry Secondary I/O APIC Control Option to **Disable Secondary I/O APIC** and the entry PIC Interrupt Routing Mode to **Route interrupts directly to Local APIC**.

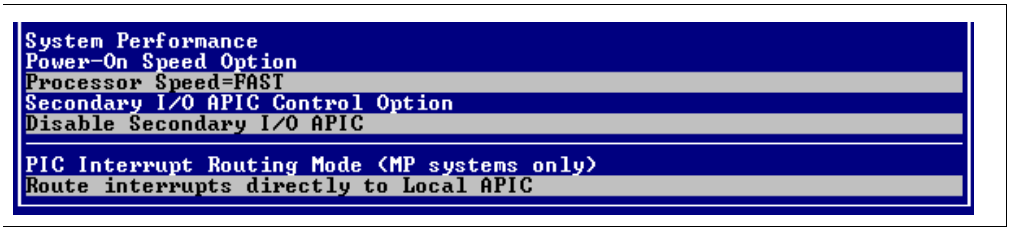

System Performance
Power-On Speed Option
Processor Speed=FAST
Secondary I/O APIC Control Option
Disable Secondary I/O APIC
PIC Interrupt Routing Mode (MP systems only)
Route interrupts directly to Local APIC

Figure 24. APIC Settings

5. Scroll the list down to *BOOT SUBSYSTEM GROUP* and set the First Boot Device to **Boot IDE CD-ROM Hard Drive Image**, the Second Boot Device to **Boot Floppy** and the Third Boot Device to **Boot Hard Disk**. You can also set the entry Perform Memory Test on Warm Boot to **Disable.** This saves a lot of time as you have to reboot the server often during the system and Windows NT intallation.

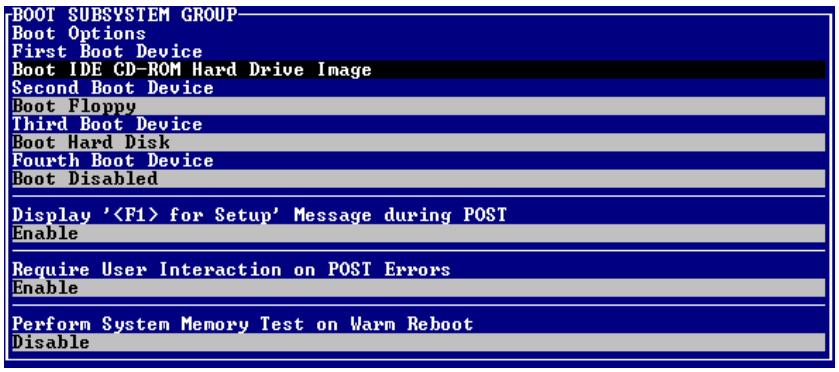


Figure 25. BOOT Options

6. Scroll the list further to MANAGEMENT SUBSYSTEM GROUP/ SYSTEM MANAGEMENT OPTIONS and set the System Management Mode to **Enable**, the SMM Time Stamp Source to **Real-Time Clock**, the Event Logging to **Enable** and the PCI System Error Detection to **Disable**.

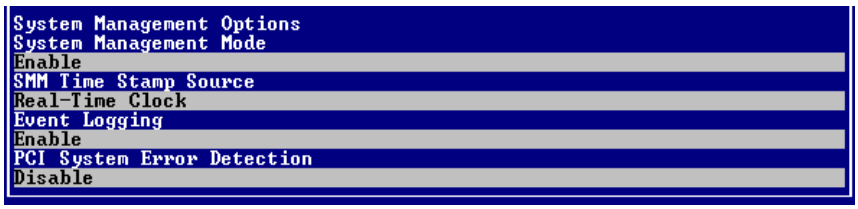


Figure 26. System Management Options

7. Go back to the main menu.
8. Select **Save Configuration** in the main menu.
9. Select **Exit** to finish the SCU and reboot your system.

2.12.3 Configuration ServeRAID Adapter

The next steps cover the RAID configuration for the Windows NT installation with the ServeRAID offline tool from the IBM ServeRAID and ServeRAID II configuration diskette.

The Windows NT installation for SAP R/3 is usually made on the 4.5 GB hardware mirrored hard disk drives. We recommend that you create one logical RAID-1 drive with 4000 MB on these drives of the ServeRAID adapter, and use the remaining space for a second Windows NT installation on a second logical drive.

Hot Spare Considerations

The ServeRAID adapter is able to create logical drives with different RAID levels in RAID arrays. If you plan to use Hot Spare Drives do not create the second logical drive as RAID-0 for the second Windows NT installation. Hot Spare Drives do not stand in for arrays containing RAID-0 logical drives.

We recommend you do a second Windows NT installation for emergency and recovery purposes. If there is a problem in your Windows NT system, you can boot the second Windows NT installation and get access to all NTFS formatted drives to see what has happened and correct the problem, and save or restore data.

Note

The ServeRAID adapter-created logical drive is seen by the Windows NT system as one physical disk. If you create only one logical RAID 1 drive over all disk space and install the second NT on a second partition on the first logical drive your first Windows NT installation would be on a primary operating system partition and your second Windows NT installation on a extended partition. Instead there are two logical RAID drives in both Windows NT installations on separate primary partitions.

Windows NT Installation and Logical Drives

Only one logical drive should be created for the installation process. If any other drives are defined and you are trying to install to a partition greater than 1 GB, this will cause problems. After installation is complete, you can then go back or use the ServeRAID Administration and Monitoring Utility in Windows NT and add the rest of the logical drives that you need. Also, NT can only install to a partition that is 4 GB or less. Therefore, you may want to make the first logical drive 4096 MB in size.

You will find further information about installing ServeRAID adapters in the ServeRAID adapter documentation and in the redbook *Implementing PC ServeRAID SCSI and SSA RAID Disk Subsystems,* SG24-2098.

The following steps describe the ServeRAID configuration with the ServeRAID Configuration utility.

To load the program insert the IBM ServeRAID and ServeRAID II configuration diskette in the floppy drive. Then reboot the server from the floppy drive. The RAID configuration utility is automatically loaded.

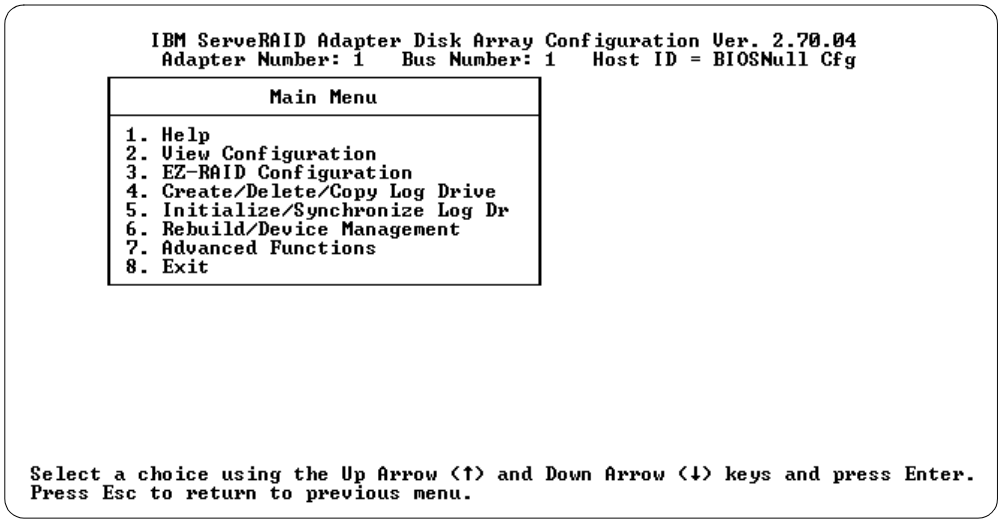

IBM ServeRAID Adapter Disk Array Configuration Ver. 2.70.04
Adapter Number: 1 Bus Number: 1 Host ID = BIOSNull Cfg
Main Menu
1. Help
2. View Configuration
3. EZ-RAID Configuration
4. Create/Delete/Copy Log Drive
5. Initialize/Synchronize Log Dr
6. Rebuild/Device Management
7. Advanced Functions
8. Exit
Select a choice using the Up Arrow (↑) and Down Arrow (↓) keys and press Enter.
Press Esc to return to previous menu.

Figure 27. ServeRAID Configuration Utility Main Menu

2.12.3.1 ServeRAID Adapter Settings and Array Configuration

For this configuration, it is assumed that all drives you want to use are recognized by the ServeRAID adapter and in ready state (RDY). You can check the current configuration by selecting **2. View Configuration** in the main configuration menu.

Initialize Configuration

When the ServeRAID adapter does not recognize all drives or there is an older array configuration on the adapter, it is advisable to initialize the adapter configuration, which will reset the adapter configuration, delete all old RAID configurations, scan the SCSI bus for new drives and set all recognized drives to the status of *ready*.

1. Select **7. Advanced Functions** in the configuration main menu.
2. Then select **7. Init/View/Synchronize Config**.

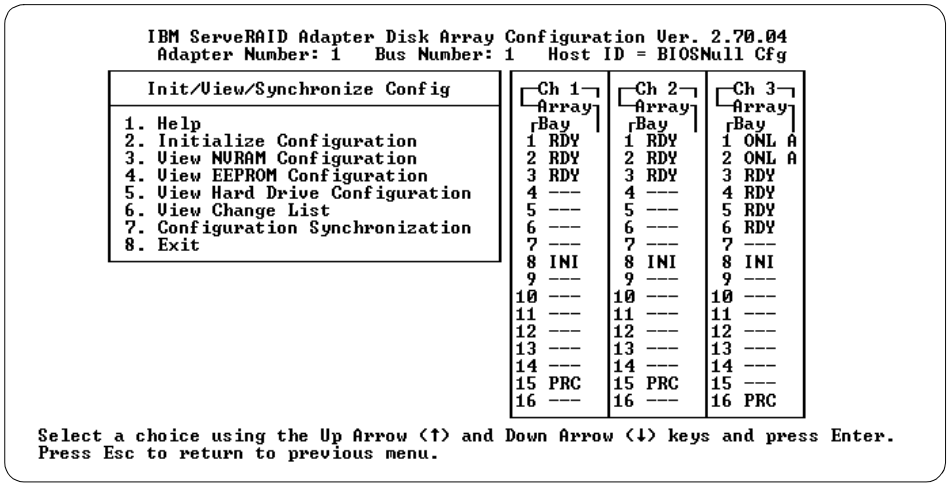


Figure 28. Initialize Configuration

3. To initialize the configuration select **2. Initialize Configuration.**
4. Read the warning and press any key to confirm.

   Note: This procedure will delete all older RAID configurations and reset all setup values of the ServeRAID adapter to the defaults, such as stripe size, write policy, SCSI transfer mode and so on.
5. Confirm the initialization by answering **Yes.**
6. Press Esc twice to go back to the configuration main menu.

Note: If the configuration initialization fails with a time-out error or hangs the server during the initialization, then turn off the server, remove all SCSI cables from all channels, reboot the configuration diskette and repeat the procedure. Then install the cables again and reboot the server with the configuration utility. All drives should now be recognized.

SCSI Fast/Wide Ultra Transfer Mode

The SCSI data transfer rate for the ServeRAID adapter is the default Fast/Wide transfer mode with 10 MHz (20 MBps with 16-bit wide devices). You can improve your performance by setting this to 20 MHz (40 MBps with 16 -bit wide devices) if your hardware supports the Fast/Wide Ultra transfer mode.

Supported hardware means the combination of hard drives, backplanes, cables and external enclosures must be able to support Ultra transfer modes. The Netfinity 7000 backplane, the daisy-chained backplanes with repeater kit and the EXP10 with cable lengths up to 2 meters support the Fast/Wide Ultra transfer mode. This setting can be changed separately for each of the three ServeRAID channels.

1. Select **7. Advanced Functions** in the ServeRAID adapter configuration main menu.
2. Select **8. Display/Change Adapter Params**.
3. Select **3. Change Adapter Host/SCSI ID**.
4. Choose the entryfor the SCSI Transfer Rate for the SCSI channel you intend to change. Enter the value 20 to set that channel to Ultra SCSI transfer mode.

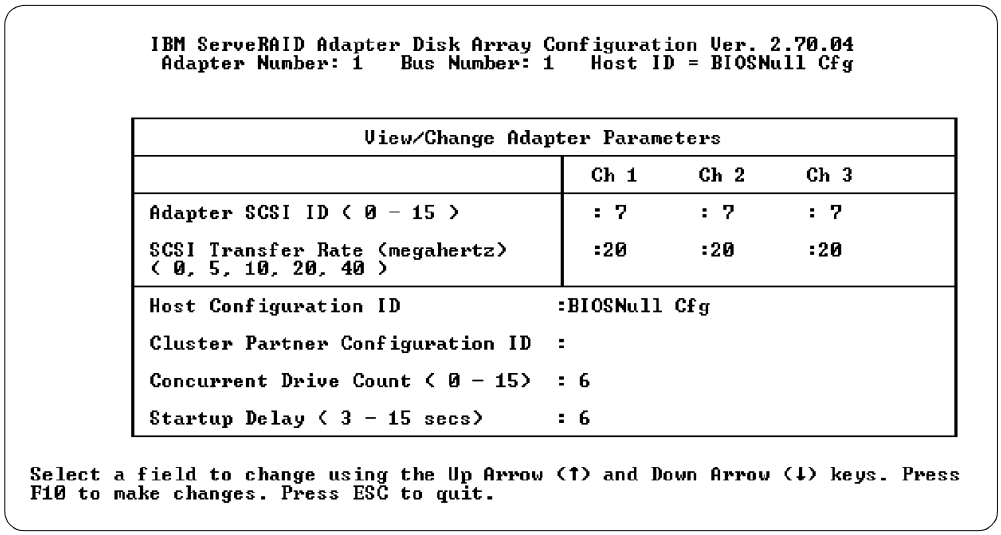

IBM ServeRAID Adapter Disk Array Configuration Ver. 2.70.04
Adapter Number: 1 Bus Number: 1 Host ID = BIOSNull Cfg
View/Change Adapter Parameters
Ch 1 Ch 2 Ch 3
Adapter SCSI ID (0 - 15) : 7 : 7 : 7
SCSI Transfer Rate (megahertz) (0, 5, 10, 20, 40) :20 :20 :20
Host Configuration ID :BIOSNull Cfg
Cluster Partner Configuration ID :
Concurrent Drive Count (0 - 15) : 6
Startup Delay (3 - 15 secs) : 6
Select a field to change using the Up Arrow (↑) and Down Arrow (↓) keys. Press F10 to make changes. Press ESC to quit.

Figure 29. Set SCSI Transfer Rate

5. Press F10 and confirm with Yes to save your changes.
6. Press any key.
7. Press Esc twice to go back to the configuration main menu.

Check Extended BIOS Mapping

The range of older IBM RAID adapters supports only BIOS mappings of 2 GB. The BIOS Compatibility Mapping setting in the ServeRAID adapter is to support RAID Arrays created by the older RAID adapters. You have to set this parameter to Extended BIOS Mapping (8 GB) if you want to boot partitions greater than 2 GB. The default setting is already Extended BIOS Mapping (8 GB). To check the setting do the following:

1. Select **7. Advanced Functions** in the ServeRAID adapter configuration main menu.
2. Select **8. Display/Change Adapter Params**.
3. Select **4. Set BIOS Compatibility Mapping** to check the settings.
4. When not set to Extended, select **1. Extended BIOS Mapping (8GB).**

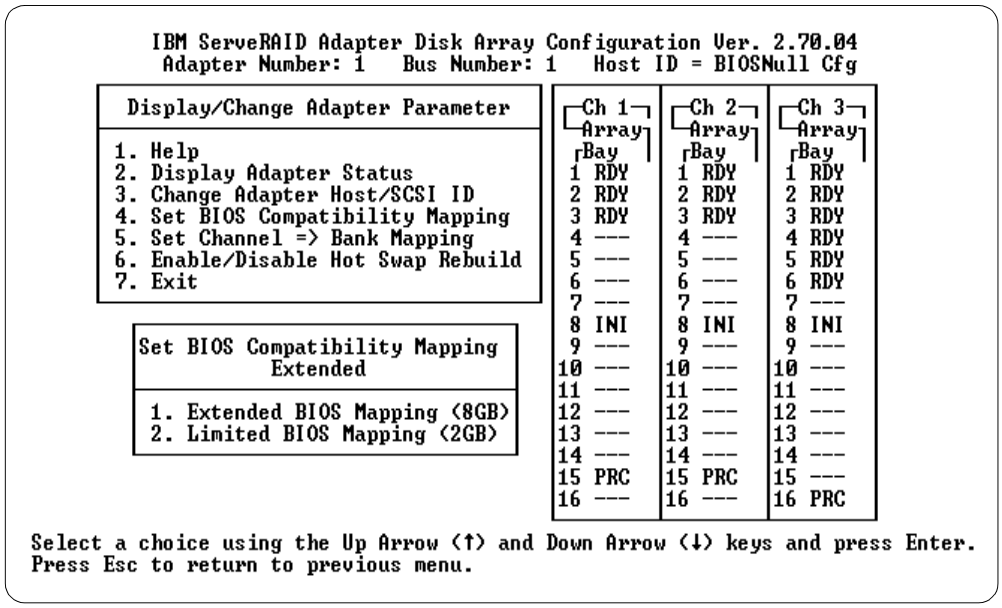


Figure 30. Set BIOS Compatibility Mapping

5. Press Esc twice to go in the configuration main menu.

Changing the RAID Parameters

There are two RAID parametersthat allow you to fine tune the RAID subsystem: s the *Stripe Unit Size* and the *read ahead* option.

Each of these options affects all arrays and all logical drives configured on the adapter.

The Stripe Unit Size is the amount of data written to a given disk before writing to the next disk in the array. The available choices are 8 KB, 16 KB, 32 KB and 64 KB. The default is 8 KB. If you set the stripe unit size to be 32 KB or 64 KB, you can have at most eight disk drives per array. If you set the stripe unit size to 8 KB or 16 KB, you can have at most 16 drives per array. The default is set to 8 KB. This parameter should be chosen so that the stripe unit size is close to the size of the system I/O requests or a multiple of it. This will depend on the type of applications and modules you are running, cache strategies of file and database systems, and the purpose of your server.

Data Will Be Lost

Once data is stored in the logical drive, the stripe unit cannot be changed without destroying data in the logical drives.

The read ahead option determines the way in which the ServeRAID adapter processes I/O requests from the operating system. When read ahead is enabled, the RAID adapter transfers data from a disk to its local cache in steps of stripe unit size. This provides excellent overall performance when workloads tend to be sequential. However, if the workload is random and system I/O requests are smaller than stripe unit size, reading ahead to the end of the stripe unit will result in a wasted SCSI bus bandwidth and wasted disk utilization. When read ahead is disabled, the size of data transfer from the disk to the local cache is equal to the

system I/O request size, and no read ahead to the end of the stripe unit size is performed.

Data Will Not Be Lost

The read ahead setting can be modified without destroying data in a logical unit.

To obtain optimum values is nearly impossible in a multitasking environment with many different applications, or when using SAP R/3, which has many different modules and varying and often changing user requirements.You may test your special environment for a long time and still hardly see a difference. Moreover, if you want to change the stripe size, you have to reinstall your system.

On an SAP R/3 application server the most important factor is not actually the I/O subsystem but the installed main memory and the used processors and server board technology. On the other hand, the database server needs a fast I/O subsystem but it is also a very varying situation. The access to database index files is usually sequential and the access to the database or tables is then random.

Therefore, the best compromise is to use a stripe unit size of 16 KB or leave the default setting and see if the change of the read ahead option has any effect.

To change the stripe unit size and the read ahead option do the following:

1. Select **7. Advanced Functions** in the in the ServeRAID adapter configuration main menu.
2. Select **5. Change RAID Parameters**.

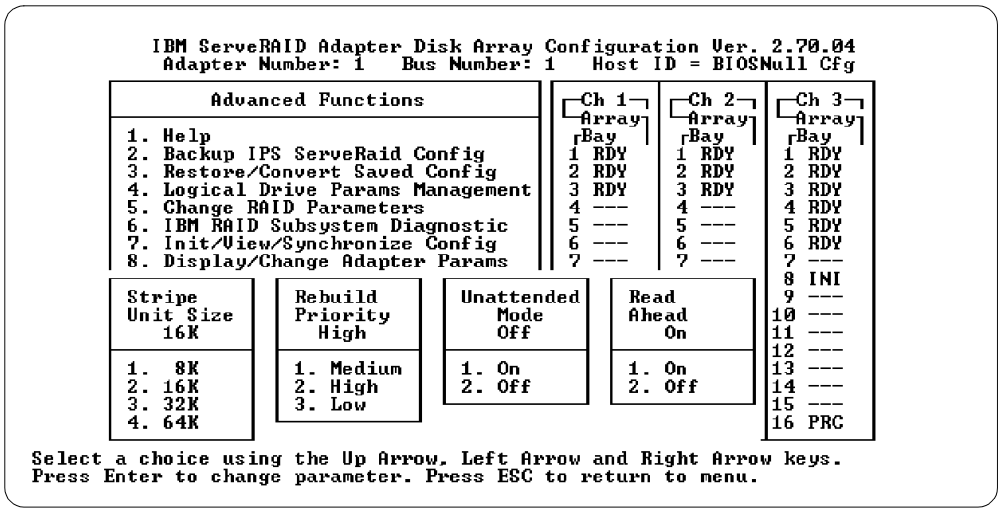


Figure 31. Change RAID Parameters

3. The current setting is shown directly below the table description.
4. Make your choices using the cursor keys and press Enter**.**
5. Press Esc to go back in the configuration main menu.

Creating Array and Logical Drive

To create your logical drive for the Windows NT installation do the following:

1. To create a RAID array select **4. Create/Delete/Copy Log Drive** in the ServeRAID adapter configuration main menu.
2. Select **3. Create Disk Array.**
3. Choose drives for the array and press Enter on every drive you wish to place in the array.
4. Press Esc to create the array.
5. To create a logical drive select **4. Define Logical Drive**.
6. Select the array where you want to create the logical drive (Array A).
7. Select a RAID level in the pop-up menu.
8. Select the logical drive size in MB (for example 4000 MB) and confirm with **Yes.**
9. All logical drives must be initialized after being created.
10. Confirm with **Yes** to initialize the logical drive. This procedure initialized only the first 1024 sectors of the newly created logical drive and will not take a long time.

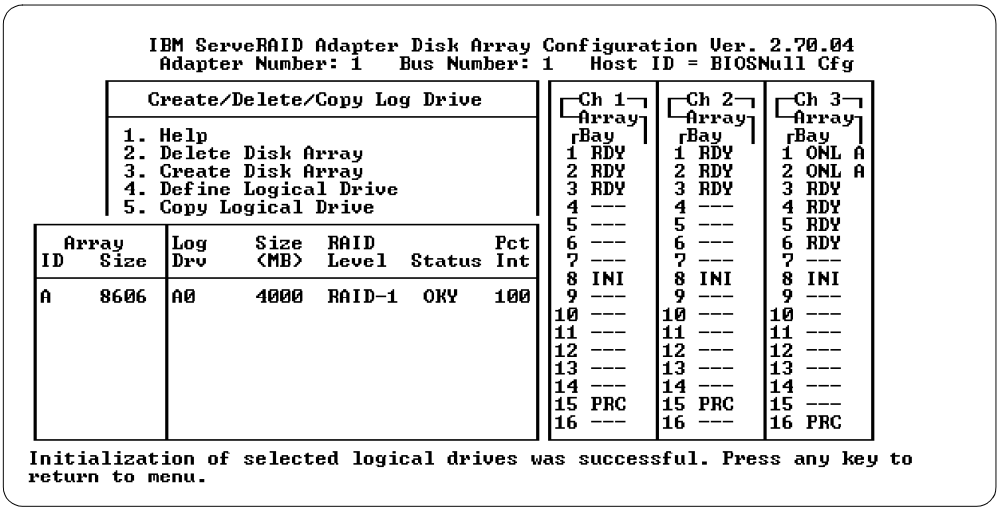

IBM ServeRAID Adapter Disk Array Configuration Ver. 2.70.04
Adapter Number: 1 Bus Number: 1 Host ID = BIOSNull Cfg
Create/Delete/Copy Log Drive
1. Help
2. Delete Disk Array
3. Create Disk Array
4. Define Logical Drive
5. Copy Logical Drive
Array ID Size
Log Drv
Size (MB)
RAID Level
Status
Pct Int
A 8606 A0 4000 RAID-1 OKY 100
Ch 1 Array Bay
Ch 2 Array Bay
Ch 3 Array Bay
1 RDY 1 RDY 1 ONL A
2 RDY 2 RDY 2 ONL A
3 RDY 3 RDY 3 RDY
4 --- 4 --- 4 RDY
5 --- 5 --- 5 RDY
6 --- 6 --- 6 RDY
7 --- 7 --- 7 ---
8 INI 8 INI 8 INI
9 --- 9 --- 9 ---
10 --- 10 --- 10 ---
11 --- 11 --- 11 ---
12 --- 12 --- 12 ---
13 --- 13 --- 13 ---
14 --- 14 --- 14 ---
15 PRC 15 PRC 15 ---
16 --- 16 --- 16 PRC
Initialization of selected logical drives was successful. Press any key to return to menu.

Figure 32. Create Logical Drive

11. If you selected RAID Level 1 for your logical drive then your logical drive is created. Press any key.
12. RAID Level 5 logical drives must now be synchronized.
13. Confirm with **Yes**
14. With the ServeRAID II adapter and Firmware V2.30.04 or higher, synchronization runs in the background and you can now go to the next steps in the installation. You can also restart or power off the system. The synchronization will continue after the system restart at the last known point.
15. Press ESC twice to leave the configuration program.

16. Confirm the warning about saving configuration to a diskette by answering Yes to quit the program. The configuration can be saved after you finished all steps of the installation.
17. Go on to the Windows NT installation.

    Note: Please remember only one logical drive should be created for the Windows NT installation process. If any other drives are defined and you are trying to install to a partition greater than 1 GB, this will cause problems. After installation is complete, you can then go back or use the ServeRAID Administration and Monitoring Utility in Windows NT and add the rest of the logical drives that you need.

Synchronization

With the ServeRAID adapter, ServeRAID on-board controller and ServeRAID II adapter, synchronization is required to ensure the parity accurately reflects the data. If synchronization or data scrubbing is performed on an array that was never previously synchronized, then any media defect found that requires RAID reconstruction may be rebuilt using incorrect parity which may result in data loss.

2.12.3.2 The ServeRAID II 8 MB Battery-Backup Cache

The ServeRAID II battery-backup option (part #76H5401) provides a battery-backup cache for the ServeRAID II adapter. If power to the server or adapter is interrupted, the data written to the ServeRAID II adapter is not lost because a battery maintains power to the backup cache.

This gives you the possibility to improve your write performance by using the advantages of write caching on your logical drives without the risk of data lost. An additional powerful feature of this option allows you to change the battery-backup to the new adapter if your ServeRAID II adapter is damaged and this new adapter will write back the unsaved write cache data to the drives.

After installing the battery-backup cache you must set the write policy to write-back mode for the adapter to use the battery-backup cache. This mode can be changed without deleting or affecting your already created logical drives and their data.

To set a logical drive to the write-back (WB) mode, do the following:

1. Start the ServeRAID configuration program from the IBM ServeRAID and ServeRAID II configuration diskette.
2. Select **7. Advanced Functions** in the in the ServeRAID adapter configuration main menu.
3. Select **4. Logical Drives Params Management** in the next menu.
4. In this menu Select **2. Change Write Policy**.
5. Select the logical drive whose write policy you want to change.

6. Press Enter to toggle between Write-Through (WT) and Write-Back (WB) mode. For write caching set it to WB.

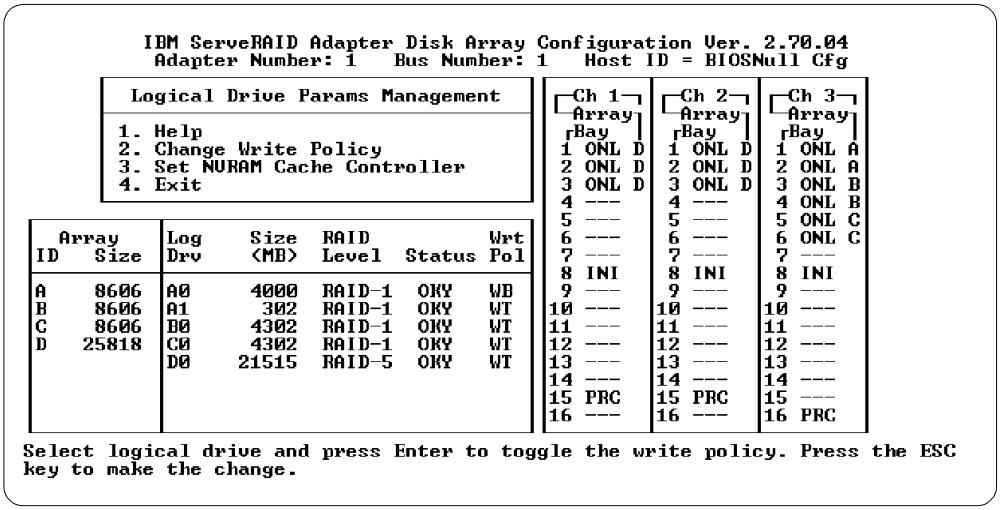


Figure 33. Changing the Write Policy of the Logical Drives

7. Press Esc twice to go back to the main menu and leave the program.

2.12.3.3 Backing Up the ServeRAID Configuration

After you finish installing Windows NT, creating all other logical drives, and changing all RAID parameters, you should save your ServeRAID configuration to a diskette. You can use this diskette to restore your ServeRAID configuration if the ServeRAID adapter was damaged or another failure with your configuration occurs. Please save the configuration every time your configuration is changed.

1. Start the ServeRAID configuration program from the IBM ServeRAID and ServeRAID II configuration diskette.
2. Select **7. Advanced Functions** in the ServeRAID adapter configuration main menu.
3. Select **2. Backup IPS ServeRAID Config**.
4. Type in a file name and press Enter to save the configuration to this file.

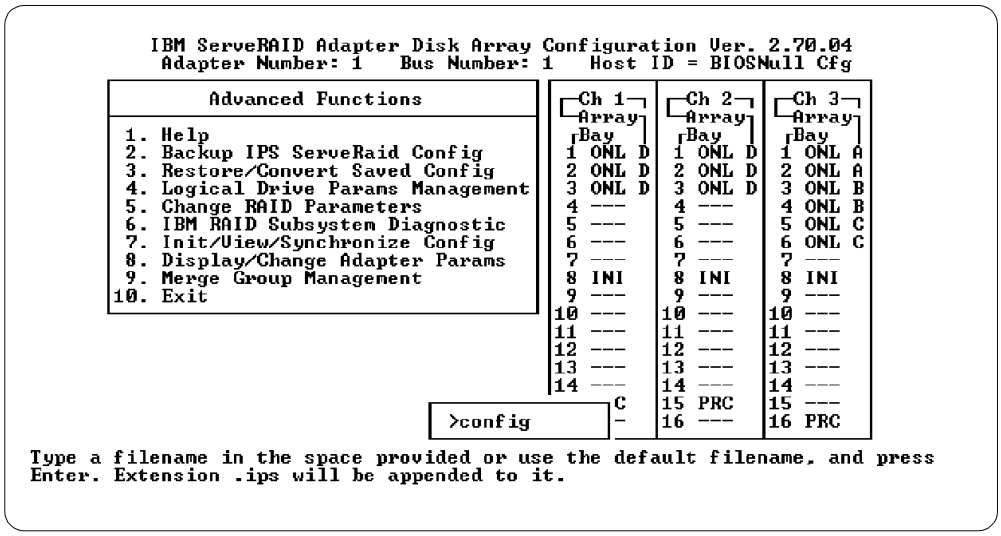


Figure 34. Back Up the ServeRAID Configuration

You can use your ServeRAID configuration diskette to save the file on it.

5. Press ESC twice to leave the ServeRAID configuration program.

2.12.4 Protecting the Netfinity 7000

The following security features help you to protect your Netfinity 7000 server. The settings are done in the BIOS Setup program or in the SCU.

- User and Administrator password
- Ability to disable the Power-on and reset button

  The power switch and reset button will be disabled when the system is in secure mode.
- Keyboard and mouse lockout timer to join in the secure mode

  You can specify a keyboard/mouse inactivity time-out period. If the timer is enabled, and no keyboard or mouse action occurs for the specified period, keyboard and mouse input will be inhibited. In addition, if you have enabled these security features the monitor display will go blank, and the diskette drive (if enabled) will be write-protected. To resume activity, enter the password.
- Enter secure mode immediately with hot-keys

  To secure the system immediately, rather than wait for the inactivity time-out period, use a hot-key combination that you set through the SCU or Setup.
- Disable writing to diskette

  If the system is in secure mode, it will not boot from or write to a diskette unless a password is entered. This feature is an option of the Security Subsystem Group in the SCU. To write-protect diskette access whether the system is in secure mode or not, use the Setup main menu, click on **Floppy Options**, and specify Floppy Access as read only.
- Administrator password controls access to using the SCU

  To control access to setting or changing the system configuration, set an administrative password and enable it through Setup or the SCU. If both the

administrative and user passwords are enabled, either can be used to boot the system or enable the keyboard and/or mouse, but only the administrative password will allow Setup and the SCU to be changed. To disable a password, change it to a null string.

- User password controls access to the system.

  To control access to using the system, set a user password and enable it through Setup or the SCU. To disable a password, change it to a null string.

- Secure boot mode (Unattended Start)

  When this mode is enabled, the system can boot and run the operating system, but no mouse or keyboard input is accepted until you enter the user password. In secure boot mode, if a diskette is detected in drive A at boot time, the system will prompt for a password. When the password is entered, the system will boot from the diskette, and the system will no longer be in secure mode. If there is no diskette in drive A, the system will boot fromthe hard drive and will be in the secure mode automatically. Even if the power cycles off and on for an unattended system, it still comes up in secure mode. All of the secure mode features that are enabled will go into effect at boot time.

- Boot without mouse and keyboard

  The BIOS will boot whether a keyboard or mouse is installed or not. POST automatically detects the presence of a keyboard and mouse, and the keyboard and mouse are tested if present. There is no entry in the SCU to enable or disable a keyboard or mouse.

- Lock keys (only tower models)

  Mechanical lock on the front, right side cover limiting access to the 12 hot-swap drive bays, five removable device bays power-on and reset buttons.

- Optional Netfinity Security Cover III back panel (#94G7427)

2.13 Installing and Setting Up Your Windows NT 4.0 Server

This section describes the installation of Microsoft's server operating system Windows NT 4.0. You will need the Windows NT English version for the SAP R/3 installation. Only this is supported by SAP. Do not use any other language versions. After the installation you have to apply the Service Pack 3.

A good idea for the installation would be to disable the Warm Boot Memory check. If you have not done that yet, reboot the server and press F1 to enter the System Setup program. Then select in the main menu **Boot Options** and change the Memory Test on Warm Reset to **Disable**. Finally, press F10 to save and exit.

Windows NT 4.0 Installation

Windows NT 4.0 will not install if more than 3 GB of memory is installed in the system. You must first complete the installation with less than 3 GB of memory and install Windows NT Service Pack 3. After the service pack is installed, you can then install up to 4 GB of memory.

2.13.1 Windows NT Installation

1. Insert the IBM PC ServeRAID Device Driver Diskette in the floppy diskette drive and the Windows NT boot CD-ROM in the CD ROM drive and then reboot the server.
2. Press F6 at the Windows NT setup message: `Setup is inspecting your computer's hardware configuration... .`
3. At the next screen, select **S** to specify additional devices.
4. Select **other** from the list of SCSI adapters.
5. When prompted to insert a manufacturer-supplied support disk, make sure that the IBM ServeRAID and ServeRAID II Device Driver Diskette is in the floppy drive and press Enter.
6. Select **IBM ServeRAID Adapter** and press Enter.
7. Press Enter to continue to the next screen.

System Processors

If the Windows NT kernel is loaded it recognizes only one system processor the first time. This is normal situation also if four processors are installed in the system.

8. Press Enter at the Welcome to Setup Screen.
9. The next screen should say that setup has recognized the mass storage devices in your computer. At this point Windows NT should have recognized three devices:
    1. IDE CD-ROM (ATAPI 1.2)/PCI IDE Controller
    2. Adaptec AHA -294X/AHA-394X/AIC-78XX
    3. The IBM PC ServeRAID adapter
10. Press Enter to continue to the next screen.
11. You may receive a message that setup has determined that one or more of your hard disks has more than 1024 cylinders. Press Enter to continue.

    Note: The IBM ServeRAID adapter utilizes extended DOS translation to accommodate this configuration.
12. You may receive a message that your computer's startup hard disk is new or has been erased, or that an operating system is installed on your computer with which Windows NT cannot coexist. Press C to continue the installation.

Warning

Any data currently on your computer's startup hard disk will be permanently lost.

13. Page down to the license agreement and press F8 to agree and continue installation.
14. Select an appropriate keyboard layout and then press Enter at the No changes: the above list matches my computer screen.
15. Press C to create a partition, then enter its size and press Enter.

Note: The partition size should range from 300 MB to no greater than 2000 MB for FAT partitions, and from 300 MB to no greater than 4000 MB for NTFS partitions. We recommend a partition size of 4000 MB for the SAP installation.

16. When prompted for the partition, select the less than 4 GB partition that was created previously.
17. Select **FAT file system** or **NTFS file system** and press Enter to format the installation partition.
18. Specify an installation directory and press Enter (the default is C:\WINNT).
19. Press Enter to allow Setup to check your hard drive, or Esc to skip the examination.
20. Setup then copies files to your hard drive.
21. Remove the Windows NT Server CD-ROM and the IBM ServeRAID and ServeRAID II Device Driver Diskette from the drives when prompted and press Enter to reboot the server.

System Processors

If you installed more than two processors the Windows NT kernel is loaded it recognize only two system processors in this step . This is a normal situation also if there four processors are installed in the system.

22. The system runs the Windows NT kernel and may then run chkdsk. It converts the file system to NTFS and reboots a second time.
23. Reinsert the Windows NT Server CD-ROM when prompted and press Enter at the Windows NT Setup screen.
24. Press Enter in the Windows NT Setup window.
25. Enter your name and organization and press Enter.
26. Enter your CD Key, located on the back of the CD jewel box, and press Enter.
27. Enter your number of users per server or click per seat and press Enter.
28. Select the server name and press Enter.
29. Select **Stand-Alone Server** as the server type**.**

Note

For performance and security reasons, SAP does not recommend that you install an R/3 database server or R/3 application server on a Primary Domain Controller (PDC) or a Backup Domain Controller (BDC).

Server Type

The only way to change the server type is to reinstall, so choose carefully.

Server types include:

- Primary Domain Controller (PDC):

  This server tracks changes made to accounts of all computers on the network. Only one is necessary per domain.

- Backup Domain Controller (BDC):

  This server acts as a backup to the PDC. Multiple BDCs are allowed per domain.

- Stand-Alone Server:

  This serves as neither a PDC or BDC. The server can be a member of a domain or a workgroup. You can change the setting whether the server is a member of a domain or a workgroup at a later time without reinstalling the Windows NT server. The server must not be a member of a domain for the SAP R/3 installation.

30. Enter the Administrator Account password and press Enter.
31. Press Enter to create an Emergency Repair Diskette.
32. Select or deselect components by clicking the check boxes next to components and press Enter twice to continue.

    Note: You need not select any particular components for the SAP R/3 installation.

33. Select **This computer will participate on a network** and click the check box **Wired to the network** and press Enter.
34. Deselect the checkbox **Install Microsoft Internet Information Server** and press Enter. We recommend that you first finish the Windows NT installation. There is an icon for the installation of the Microsoft Internet Information Server on your Windows NT desktop after the installation. With this you can install it after your system is up and running.
35. Click on **Start Search** to find supported network adapters in the server.
36. If you are using the IBM EtherJet 100/10 PCI Adapter then do the following:
    - Deselect the check box for the **/ntel 82557-based 10/100 Ethernet PCI Adapter.**
    - Click **Select From List...** and then **Have Disk...**.
    - Insert the EtherJet 100/10 PCI Adapter Drivers Diskette Disk 1 of 2 in the floppy diskette drive and press Enter.
    - Select the **IBM 100/10 Etherjet PCI Adapter** and click **OK**.
    - If you don't want to install further adapters leave the EtherJet 100/10 PCI Adapter Drivers Diskette in the floppy diskette drive. The setup will copy some files at a later time.

37. If your adapter is supported but not detected by Setup then do the following:
    - Click **Select From List...**, then **Have Disk...**.
    - Specify the path to the driver and press Enter.
    - Click **OK** to choose the driver and **OK** again to return to Setup.
38. When you are finished selecting network adapters, press Enter from the Windows NT Server Setup screen.
39. Select Network Protocols to install and press Enter when finished.

> **Note**
>
> You have to install TCP/IP protocol for SAP R/3. Select the other protocols if your network uses one of these. If you chose to install Microsoft Internet Information Server, the TCP/IP protocol is selected by default.

40. Select Network Services to install and press Enter twice when finished.
41. You will now have to configure the settings for your Network Cards and press then Enter.
42. You will now need to configure any Network Protocols specified earlier in the setup. Information required for each protocol varies by your specific network configuration.

    Note: Enter the host name in the TCP/IP setup in the DNS folder in lowercase.
43. Next, deselect any network bindings you do not wish to install and press Enter twice to start the network and continue installation.
44. Enter the name of the domain to which this server will connect or enter only the group name in the Workgroup field.

    Note: You will have to know the user name and password to be able to connect to the proper domain if your server should be a member of a domain.
45. Press Enter twice to Finish setup.
46. Select a proper date and time for the server as well as the appropriate time zone and press Enter or click **Close**.
47. Select appropriate Display settings and click **Test** and then click **OK** to test these settings.
48. Choose **Yes** when appropriate display settings are found and then press Enter twice.
49. Setup now finishes copying files to the hard disk.
50. Remove diskette and CD-ROM and press Enter to restart the server.
51. Installation is now complete.

> **System Processors**
>
> If the Windows NT kernel is loaded it should now recognize all installed processors in the system.

2.13.2 Install Windows NT 4.0 Service Pack 3

Note: You will need about 75 MB of free disk space to unpack the Service Pack.

Disconnecting Your UPS

Microsoft recommends that you disconnect any UPS before upgrading your Windows NT release. This precaution applies to APC UPSs. During upgrades, Windows NT sends character strings to the serial ports. If an APC UPS is in advanced signaling mode, it may interpret such a character string as an instruction to switch to battery operation, causing the UPS to run on battery for the rest of the Windows NT installation. Such an unnecessary switch to battery power reduces battery run time and could cause the installation to fail if the battery has insufficient run time remaining.

1. Insert the FixPak CD-ROM from the ServerGuide in the CD-ROM drive.
2. Open the Windows NT Explorer and change to the CD-ROM drive in the path: \NT\EN\I386\.
3. Run the file NT4SP3_I.EXE.
4. Press Enter on the Service Pack Setup Screen to begin installation.
5. Agree to the license and press Enter.
6. Select to create the Uninstall directory or not and press Enter twice to continue.
7. The Service Pack is copied to your system.
8. If the message asking if you want to replace C:\WINNT\SYSTEM32\SCHANNEL.DLL pops up, select **Replace**.
9. After installation is complete, click **OK** or press Enter to reboot the server.

Note: Reapply the Service Pack if you add other Windows NT components (for example, Internet Infomation Server) after this installation.

2.13.3 Install the Second Windows NT

You can now install the second Windows NT for emergencies. Before you start remove the drive letter *D:* from your CD-ROM drive and assign another one.

Start the *Windows NT Disk Administrator* by selecting **Programs/Administrative Tools/Disk Administrator** in the Windows NT start menu. Click with the right mouse button on your CD-ROM drive to call a local pop-up menu and select **Assign Drive Letter...**. Assign for example *Z:* as the new drive letter and close the Disk Administrator.

Then create the second logical drive with the IBM ServeRAID and ServeRAID II configuration diskette as described in “Creating Array and Logical Drive” on page 64.

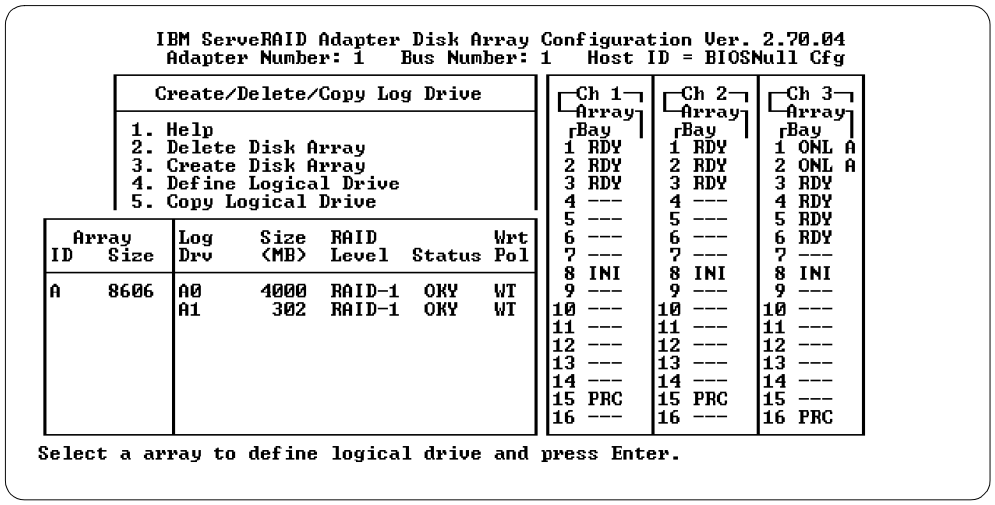

IBM ServeRAID Adapter Disk Array Configuration Ver. 2.70.04
Adapter Number: 1 Bus Number: 1 Host ID = BIOSNull Cfg
Create/Delete/Copy Log Drive
1. Help
2. Delete Disk Array
3. Create Disk Array
4. Define Logical Drive
5. Copy Logical Drive
Array ID Array Size
Log Drv
Size (MB)
RAID Level
Status
Wrt Pol
A 8606
A0 4000 RAID-1 OKY WT
A1 302 RAID-1 OKY WT
Ch 1 Array Bay
Ch 2 Array Bay
Ch 3 Array Bay
1 RDY 1 RDY 1 ONL A
2 RDY 2 RDY 2 ONL A
3 RDY 3 RDY 3 RDY
4 --- 4 --- 4 RDY
5 --- 5 --- 5 RDY
6 --- 6 --- 6 RDY
7 --- 7 --- 7 ---
8 INI 8 INI 8 INI
9 --- 9 --- 9 ---
10 --- 10 --- 10 ---
11 --- 11 --- 11 ---
12 --- 12 --- 12 ---
13 --- 13 --- 13 ---
14 --- 14 --- 14 ---
15 PRC 15 PRC 15 ---
16 --- 16 --- 16 PRC
Select a array to define logical drive and press Enter.

Figure 35. Logical Drive for the Second Window NT Installation

Note

Create the logical drive for the second Windows NT before you create, format and partition additional logical drives for data space and the SAP R/3 installation. The order in which you create the logical drives is the scan order in which the Windows NT installation program will recognize logical drives and any created partitions.

Repeat the steps for Windows NT and Service Pack installation. You may use the same IP addressing as you did in the first Windows NT installation but use another host name to avoid possible domain conflicts.

After the second Windows NT installation make the following changes in the boot.ini file on your start disk.

1. Set the default boot entry back to your first Windows NT installation partition.
2. Move the two entries for the second Windows NT installation down after the two entries for the first Windows NT installation for a better overview in the BOOT menu during the normal system start.
3. Change the description for the second Windows NT installation to differentiate the two installations during the system start.

Figure 36 shows a modified boot.ini file.

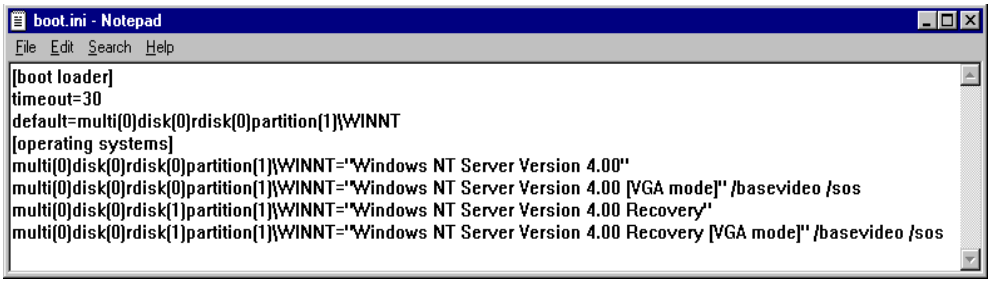

boot.ini - Notepad
File Edit Search Help
[boot loader]
timeout=30
default=multi(0)disk(0)rdisk(0)partition(1)\WINNT
[operating systems]
multi(0)disk(0)rdisk(0)partition(1)\WINNT="Windows NT Server Version 4.00"
multi(0)disk(0)rdisk(0)partition(1)\WINNT="Windows NT Server Version 4.00 [VGA mode]" /basevideo /sos
multi(0)disk(0)rdisk(1)partition(1)\WINNT="Windows NT Server Version 4.00 Recovery"
multi(0)disk(0)rdisk(1)partition(1)\WINNT="Windows NT Server Version 4.00 Recovery [VGA mode]" /basevideo /sos

Figure 36. Example boot.ini File for Two Windows NT Installations

The disk value determines the adapter number, the rdisk value the logical drive and the partition value the partition number.

2.13.4 Creating an Emergency Boot Disk

With the emergency boot disk you can boot your two Windows NT installation from a floppy disk. This allows you to bring up one of your Windows NT installations and fix a problem if your system boot sector is damaged but your partitions are still operable, or your system does not boot anymore.

1. Format a floppy disk on a Windows NT command prompt.
2. Copy the following files on the disk:
   - ntldr
   - NTDETECT.COM
   - boot.ini
3. Leave the disk in the floppy disk drive.
4. Reboot your system from the floppy disk drive and test if the created disk is operable by booting once each of the two Windows NT installations.

2.13.5 The ServeRAID Administration and Monitoring Utility

The ServeRAID Administration and Monitoring Utilities assists you online in the configuration, administration, and monitoring of your ServeRAID adapter in Windows NT.

With it you can create and delete arrays and logical drives, initialize and synchronize your logical drives, configure your adapter, control and monitor the status of your adapters, arrays and logical drives. The utility integrates an error logging and is able to send alerts to the Netfinity Manager.

There are versions for stand-alone administration (administering a system containing the adapter from that system) as well as a version for client/server administration (administering a system containing an adapter from another system on a network).

An additional feature is the logical drive migration, which allows you to change the RAID level of an existing logical drive, increase the free space in an existing array and increase the drive size of an existing logical drive without deleting and destroying the data in it.

You will find further information about the ServeRAID Administration and Monitoring utility and logical drive migration in the redbook *Implementing PC ServeRAID SCSI and SSA RAID Disk Subsystems,* SG24-2098.

2.13.5.1 Installing the Administration and Monitoring Utility

1. It is assumed Windows NT is running.
2. Insert the IBM ServeRAID and ServeRAID II administration and monitoring diskette in the floppy disk drive.
3. Open the Windows NT start menu and click on **Run...**.
4. Type `A:\setup` and press Enter.
5. Follow the instructions to install the ServeRAID utility.
6. To start the utility click on **Start/Programs/IBM ServeRAID Administration**.

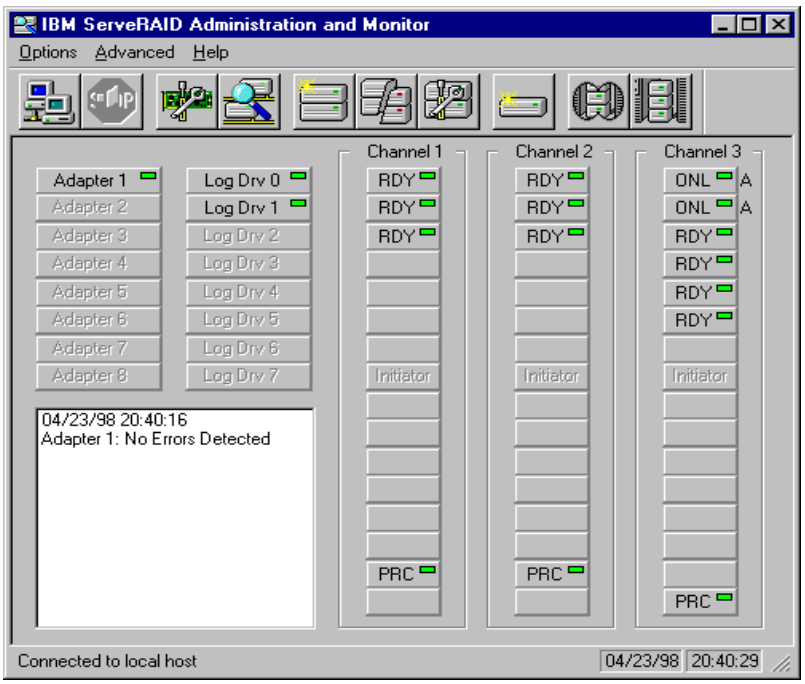


Figure 37. ServeRAID Administration and Monitoring Utility

2.13.5.2 Creating Additional Data Space for the SAP R/3 Installation

- Click in the utility on **Advanced/Manage Disk Arrays/Create Disk Array...**.

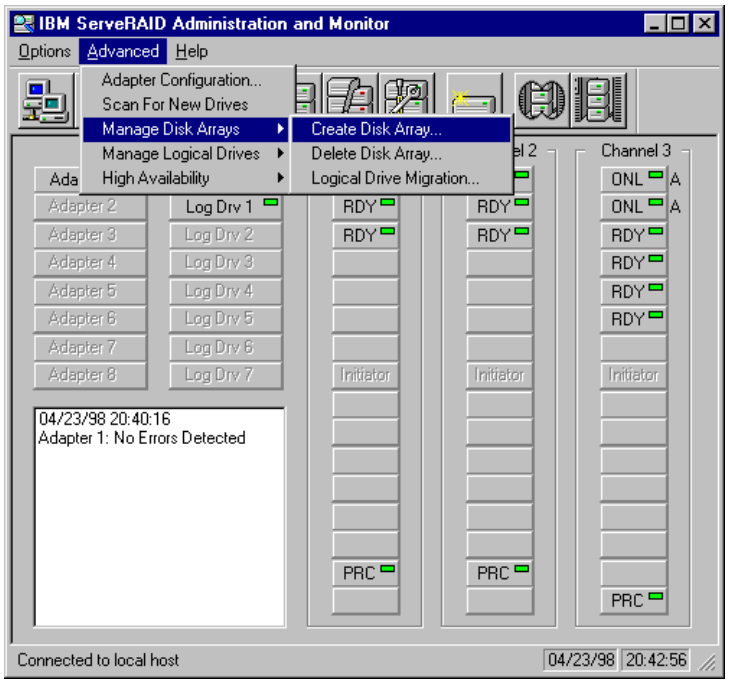


Figure 38. Create a New Array and Logical Drive

1. Select the ready drives (RDY) you wish as part of the new array and click **OK**.

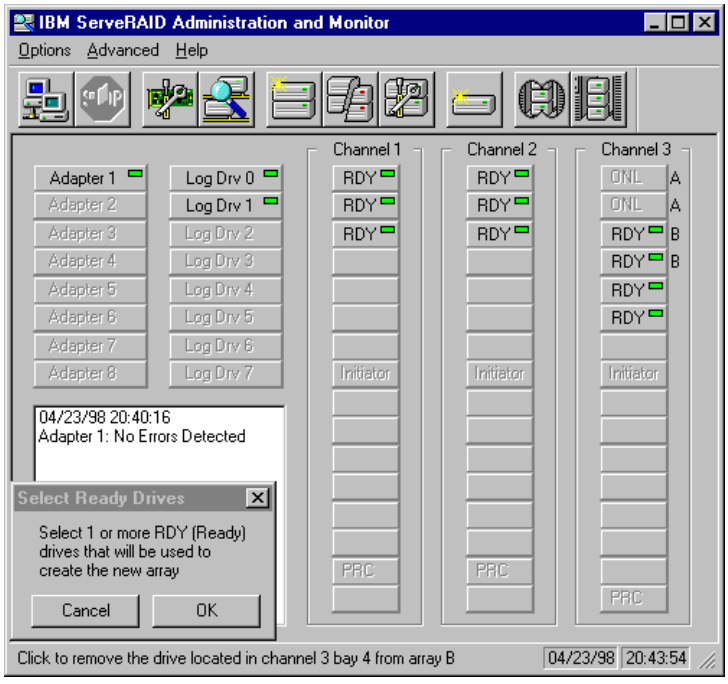


Figure 39. Selecting Hard Drives for the New Array

2. Select a RAID level and click **OK** to create the logical drive.

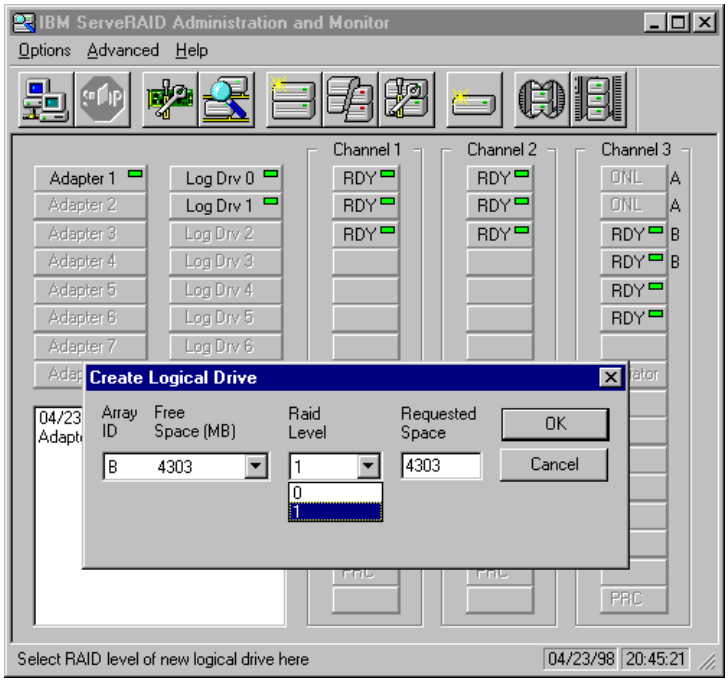


Figure 40. Selecting RAID Level and Size of the New Logical Drive

3. Repeat these steps to create additional disk space.
4. Don't forget to Initialize the new created logical drives. The synchronization for RAID level 5 logical drives starts automatically with the ServeRAID II adapter and is running in the background.
5. Click on a button for a logical drive in the administration and monitoring utility main view to initialize this drive.

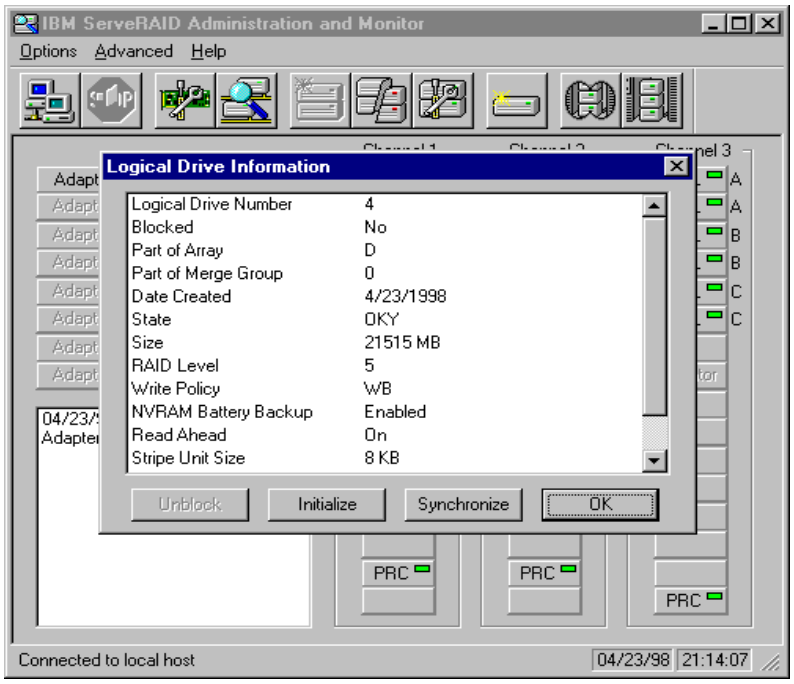


Figure 41. Initialize Logical Drive

6. Select the **Initialize** button to initialize this logical drive.
7. You can now go to the following steps and create operating system partitions on the new logical drives and format these with a file system.

2.13.6 Preparing the Disk Space for the SAP R/3 installation

You can now create partitions with the Windows NT graphical interface *Disk Administrator* to use the disk space on the new logical drives. To format your partitions for the SAP R/3 system and database installation you can use the command line program Format.com or the Disk Administrator.

For performance and security reasons you always have to format all your new disk partitions with the Windows NT File System (NTFS) for the R/3 system.

- Click on the **Start** button to open the start menu.
- Select **Programs**, then **Administrative Tools** and click on **Disk Administrator**.

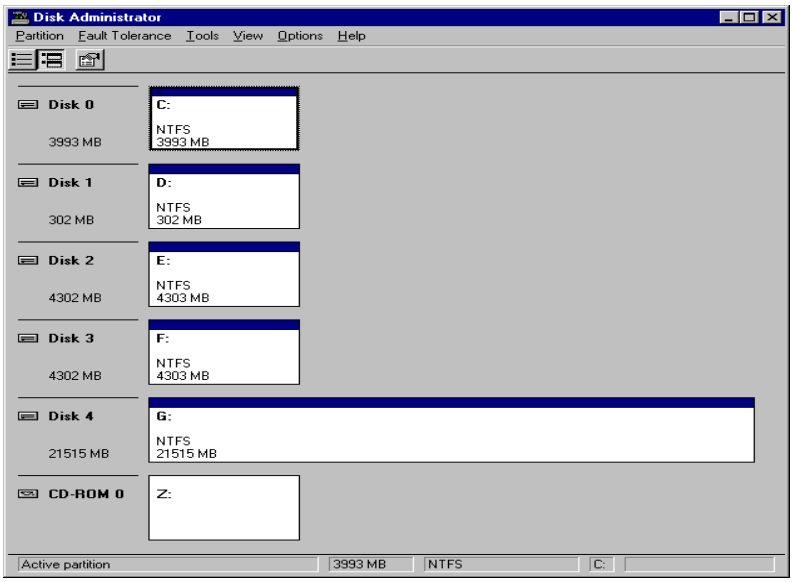


Figure 42. Windows NT 4.0 Disk Administrator

- Click with the right mouse button on a disk where you want to create a partition to open a local pop-up menu.
- Select **Create...** to create a primary or click on **Create Extend...** to create an extended partition.
- Select the size of your partition and create the partition. If you selected **Create Extended...** in the step before, you first have to select **Create...** in the local pop-up menu on your new partition to create a partition in your extended partition.
- Click with the right mouse button on the created partition, select **Commit Changes Now...** and confirm with **Yes**.
- Click again with the right mouse button on the created partition and select **Format...**. You will see a parameter window like this.

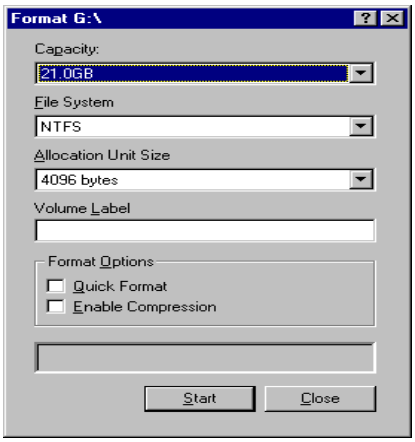


Figure 43. Format Partition

- It is a direction of SAP to format each new partition for your SAP R/3 installation with the NTFS file system and a cluster size of 4096 bytes.
- Set the parameters for the file system and cluster size and press **OK** to format the partition.
- Repeat the steps for every new partition.

Note: We recommend that you save the new disk configuration with the Repair Disk Utility as described in 2.13.10, “Repair Disk Utility” on page 87. We recommend you to repeat the procedure after the R/3 installation.

2.13.7 Tuning Windows NT Parameters for SAP R/3

Windows NT Server 4.0 is one of the few operating systems that have the ability to self optimize. This can be deceptive, as it will only administer certain aspects of the operating system. Self tuning of the operating system focuses on page file and memory management optimization. In the SAP R/3 installation manual, SAP recommends and determines settings for several of these parameters.

2.13.7.1 Multitasking

Windows NT as a multitasking operating system can run several tasks or processes at any one time on the server. Each task gets a time slice of processor time at regular intervals. This gives the appearance that all processes are running simultaneously.

In multitasking systems, there are two types of processes usually running at any one time. These are foreground and background processes.

Foreground processes are those that are running in a GUI or full-screen session at the server console, and background processes are thosethat do not require a user interface and service server request without user interaction on the server console.

Windows NT will preemptively prioritize the process threads the CPU has to attend to. However, you have some control over the rules governing this process.

- Click on the **Start** button to open the start menu.
- Select **Settings** and open the **Control Panel**.
- Open the **System** folder in the control panel.
- Select the **Performance** register tab.

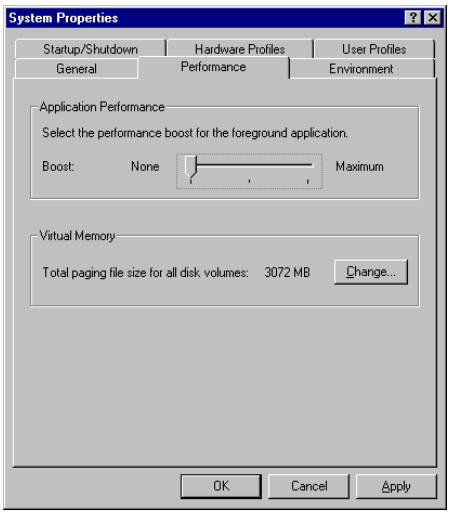


Figure 44. Forground Session Priority

There are three settings for the boost indicator that determine the priority of foreground applications.

- Maximum

  For the best response time for the foreground programs.

- Middle

  Gives background programs a better response time but still gives more processor time to the foreground programs.

- None

  Gives all programs equal amounts of processor time.

As an SAP R/3 application, database or centralized production server usually executes background sessions, and the database and R/3 services are running in the background, set this boost indicator to **None**.

2.13.7.2 Virtual Memory

Windows NT utilizes a virtual memory system, which means that it uses hard disk space to temporarily hold loaded programs that are not currently being executed. This is a technique used to reduce the amount of real memory that your system must contain in order to run the operating system.

The technique is called paging and is a procedure whereby blocks of data from physical memory are swapped to a file located on disk.

The paging file of Windows NT is PAGEFILE.SYS.

This is a contiguous area of disk that allows the Windows NT kernel to bypass the file system to read/write requested pages. You can control the amount of pre-allocated space used by PAGEFILE.SYS on your disk.

- Open the **Control Panel**.
- Open the **System** folder in the control panel.
- Select the **Performance** register tab.

- Click on the **Change** button. You will see the following dialog box.

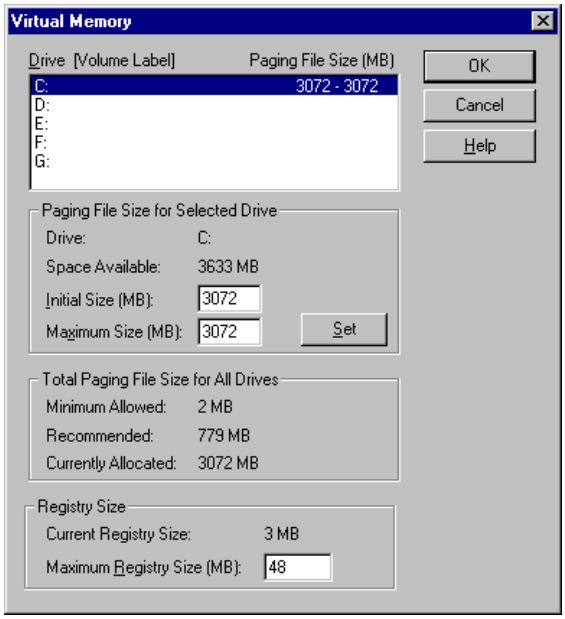


Figure 45. Page File Size and Distribution

You can set the Initial Size and the Maximum Size of the paging file for a specific drive. SAP recommends a page file size at least three times as much as your main memory. This is valid for all R/3 application and database servers. If you install an R/3 central server (database + application at one machine) calculate an additional 500 MB for the page file size.

For example, if you installed 1024 MB of main memory in the Netfinity 7000 then create a page file size of 3072 GB for an R/3 application or database server, and a page file size of 3584 MB for an R/3 central server.

It is not necessary to make changes to the registry size and it will only waste space if you increase it unnecessarily.

A feature of the NT virtual memory system is that it allows multiple paging files to be created. A way to get much better performance from your virtual memory system would be to establish paging files on more than one drive or on several logical RAID drives in different arrays. But if they are simply different partitions on the same device or simply different logical drives in the *same* array, then creating multiple paging files will actually degrade performance.

Note: Avoid placing a page file on the same disk drive together with I/O-intensive SAP R/3 files, such as database files or online redo logs.

Minimums and Maximums

When specifying a page file size, increase the minimum value to equal the maximum value. When the page file needs to grow past the minimum value, it will slow down your server in the process. By setting both values equal, you will waste some disk space but the system does not need to spend time sizing the page file. If, on the other hand, the page file partition has decreased in size since the maximum size value was set, and this partition does not contain enough disk space when the page file is expanded, NT will fail with some odd results.

2.13.7.3 Allocation of Server Memory

Windows NT will allocate as much as half of the system main memory to a disk and file cache. As a result, the operating system must often swap memory pages to disk in order to allocate enough physical memory to run new processes.

The allocation of real memory to the disk cache can be indirectly controlled by specifying how much memory to give to the server processes.

To do this:

- Open the **Control Panel**.
- Open the **Network** folder.
- Select the **Services** register tab.

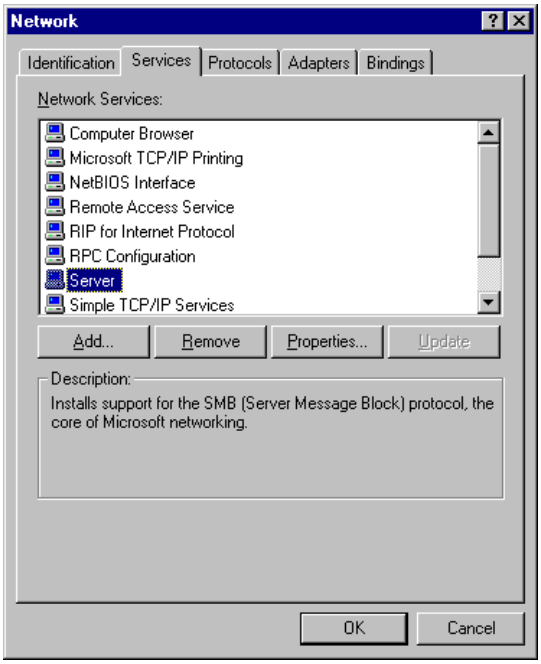


Figure 46. List of Windows NT Network Services

- Double click in the Network Services List on the **Server** service. You will see a dialog box like the one in Figure 47.

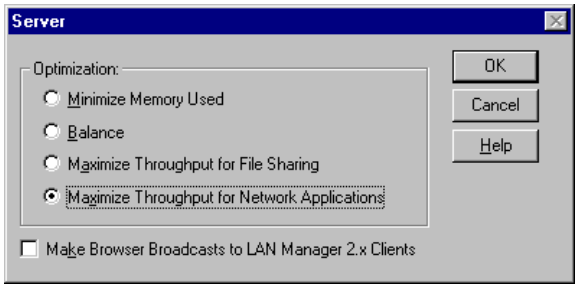


Figure 47. Server Service Tuning

You can specify how much memory is reserved for the operating system indirectly by specifying how much memory (relatively) to give to server processes.

You have four choices:

1. *Minimize Memory Used:* this choice will minimize the memory used for disk cache and maximize the memory available for the operating system. However, on file servers, the resulting performance would not be desirable. Therefore, only use this choice for Windows NT workstations.
2. *Balance:* this choice will attempt to balance the use of real memory between the operating system and the disk cache. This is a good choice for a non-dedicated server that is also used as a workstation.
3. *Maximize Throughput for File Sharing:* this choice will yield the best performance in the file server environment but will necessitate a significant amount of swapping in the machine unless you have enough memory in your system to ensure that both the disk cache and the operating system have adequate resources.
4. *Maximize Throughput for Network Application:* this choice is the recommended setting for machines used as application servers and database server. SAP recommends in its installation manuals that you use this setting for your application and database servers.

2.13.8 Installing Windows NT Driver for the ASMA Card

- To install the Windows NT driver for the ASMA card, insert the Advanced Systems Management Adapter configuration update utility and device driver diskette in the floppy drive.
- Please use the ASMA configuration diskette from the ASMA card installation steps from 2.11, “Configurating the Advanced System Management Adapter” on page 51. These installation steps created an SM.INI file on this diskette which is needed during this driver installation.
- Go to Windows NT command prompt.
- Change to the diskette drive root directory and execute the program *\NT\Setup.exe*.
- The program will copy a driver and a library file (DLL) in your Windows NT system directory and set some registry entries. During the driver installation you will see messages on your screen like this.

```
C:\>a:

A:\>\nt\setup.exe
To continue the installation of the Service Processor DLL file and
device driver, press Enter. Press any other key to quit.

SMAddress = 300
SMInterrupt = 5

Copying \nt\IBMSPW.DLL to C:\WINNT\System32\IBMSPW.DLL
Copying \nt\IBMSPW.SYS to C:\WINNT\System32\drivers\IBMSPW.SYS
The Service Processor DLL file and device driver are installed and started.

Press any key to exit.
```

- If you do not first change to the diskette root directory you will get an error message that the SM.INI file is not on the diskette.
- Please install the ASMA card driver before you install the Netfinity Manager or Services. If the driver is correctly installed and you are using Netfinity 5.1 or higher, Netfinity will recognize the adapter and install the related programs for it.
- If you are using an older Netfinity version you have to install the Netfinity add-on programs for the ASMA card from the Service Processor Manager for Windows 95 and Windows NT installation diskette after the Netfinity installation.
- The current ServerGuide which is delivered with every IBM Netfinity Server, contains at least the Netfinity Manager and Services Version 5.1.

2.13.9 Monitoring ServeRAID Adapter Events

There are two command line tools for the ServeRAID adapter on the IBM ServeRAID and ServeRAID II supplemental diskette called IPSSEND and IPSMON.

IPSSEND is a utility that provides a command-line interface for performing various tasks on an IBM PC ServeRAID Adapter. These tasks include viewing the current configuration, rebuilding a dead drive, initializing and/or synchronizing logical drives, plus many more.

IPSMON is a utility that monitors IBM PC ServeRAID Adapters for dead drives, Predictive Failure Analysis warnings (PFAs), rebuilds, synchronizations, and logical drive migrations. If any of these occur, a message is logged to the display and/or a file.

We recommend that you use the IPSMON tool to create a permanent event log file for your ServeRAID adapters. If you record these event messages to a local diskette drive or a remote network drive, and a failure on the RAID drives brings your server down, then you can look in this file and see the latest status of the adapters and the disk drives. This helps you to decide the next action to bring your server and RAID arrays back online.

To install the utilities on Windows NT you only need to create a directory on your server and copy the files from the IBM ServeRAID and ServeRAID II supplemental diskette to this directory. The files for Windows NT are located in the \NT directory on the diskette.

2.13.10 Repair Disk Utility

After you finish your all SAP R/3 installations we recommend that you update your emergency repair disks created during the Windows NT installation with the repair disk utility on every installed server. If you did not create an emergency repair disk during the installation phase you can use this utility to create a new one. There is no difference in the method of approach.

The repair information on your Emergency Repair Disk can be used to reconstruct your Windows NT system files, system configuration, and startup environment variables if they are damaged.

First you have to update the repair information for Windows NT on your hard disk. The repair information is always created during the Window NT installation and saved in the \Repair directory on your hard disk. This files have to be replaced with new files from the online registry database that contain updated information about the system configuration. Then you can create a new Emergency Repair Disk using the repair information currently saved on your hard disk.

1. Type the RDISK command at a Windows NT command prompt to start the repair disk utility.

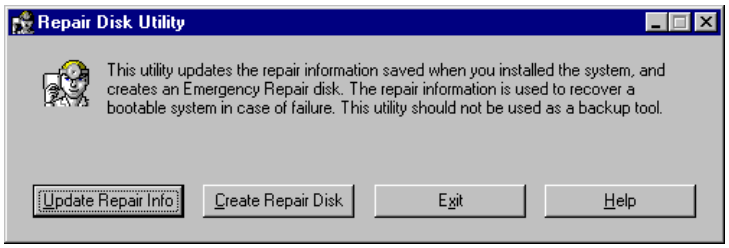

Repair Disk Utility
This utility updates the repair information saved when you installed the system, and creates an Emergency Repair disk. The repair information is used to recover a bootable system in case of failure. This utility should not be used as a backup tool.
Update Repair Info
Create Repair Disk
Exit
Help

Figure 48. Creating an Emergency Repair Disk

2. Click on the button **Update Repair Info** to update the repair information on the hard disk.
3. After the repair information is updated, the utility asks if want to create a repair disk.
4. Click on **Yes** to create the disk.
5. Insert a new floppy disk in your floppy drive and follow the instructions.
6. If your repair disk is lost or damaged you can also use the button **Create Repair Disk** in the repair disk utility to create an emergency repair disk with the current saved information on your hard disk.

Chapter 3. Installing the SAP R/3 Base System

This chapter describes the installation of SAP R/3 Release 3.1G with Oracle on Windows NT. SAP strongly recommends that R/3 only be installed by certified R/3 installers. Please refer to SAP installation documentation for further details.

It is important to first complete the SAP planning described in Appendix D, “SAP R/3 Sizing and Installation Planning” on page 141 please refer to that chapter for details on:

- Server configuration - centralized or distributed
- Disk layout
- Choosing an SAP system name, referred to as SAPSID. The SID we chose for the residency was RDU.
- Choosing a host name

Be sure you follow instructions in Chapter 2, “Configuring the Hardware and Installing Windows NT” on page 17 for installing NT. The chapter covers:

- Formatting partitions with recommended allocation size
- Allocating page space
- TCP/IP host name considerations
- Performance settings

It is also critical that the SAP OSS notes associated with the install be carefully reviewed.

3.1 System Configuration Overview

Our installation was a distributed system consisting of:

- one central instance with database server
- two application servers

We installed R/3 Release 3.1G for Oracle.

Our hardware configuration was:

- Netfinity 7000 Central Instance with Database
  - 768 MB main memory
  - Twelve 4.51GB disk drives
  - RAID controller
  - Four processors
- Netfinity 7000 Application Server
- IBM Server 325 Application Server

We decided to distribute the data on our central instance as follows:

- Windows NT and paging on two mirrored 4.5 GB disks
- Oracle redo logs on two mirrored 4.5 GB disks

© Copyright IBM Corp. 1998

- Oracle and SAP executables and non-data files on two mirrored 4.5 GB disks
- Database files on six 4.5 GB disks in a RAID 5 configuration

The application servers were configured with a minimum configuration of a single 4.5GB drive for Windows NT, paging and SAP files.

3.2 Customizing Windows NT

Before installing SAP R/3 some changes to Windows NT are required. Please refer to Chapter 2, “Configuring the Hardware and Installing Windows NT” on page 17 before proceeding. This section describes how to set up the special user IDs for SAP R/3.

3.2.1 Define SAP Users

Two Windows NT users must be defined for SAP:

- <SAPSID>ADM
- SAPService<SAPSID>

For example, the name we chose for our SAPSID was RDU. The SAP users for our installation are RDUADM and SAPServiceRDU. Perform the following steps for each user:

1. Log onto Windows NT as Administrator.
2. Click **Start/Programs/Administrative Tools/User Manager for Domains.**
3. Click **User/New User.**
4. Complete the New User screen as shown in Figure 49. Uncheck the box **User Must Change Password at Next Logon**.

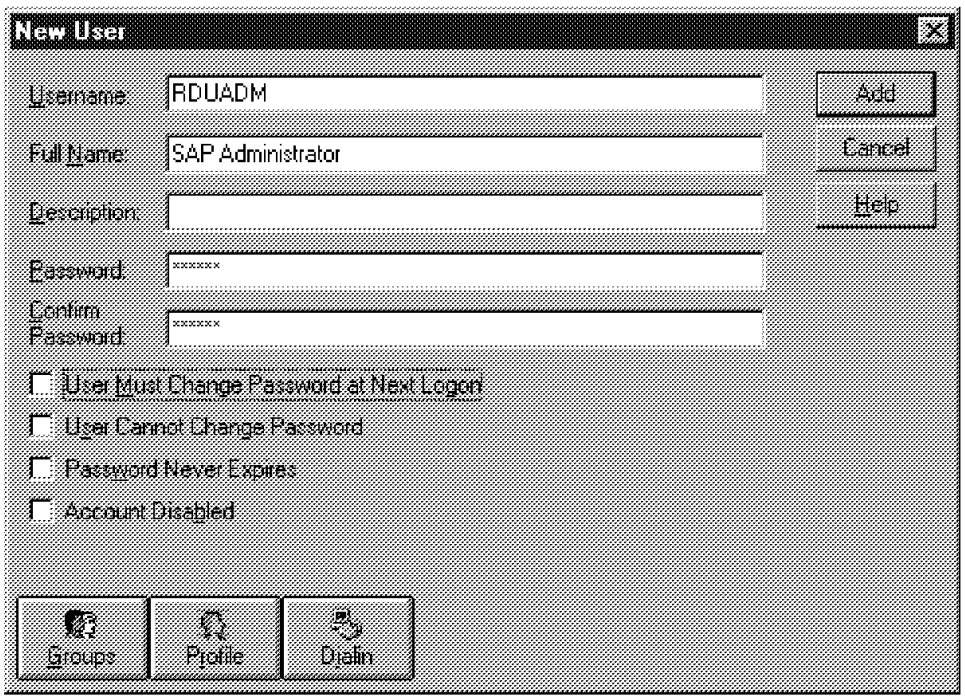


Figure 49. Create New User Window

5. Click on **Groups.**
6. Add the Administrators group to the groups the user belongs to as shown in Figure 50.
7. Click **OK**.

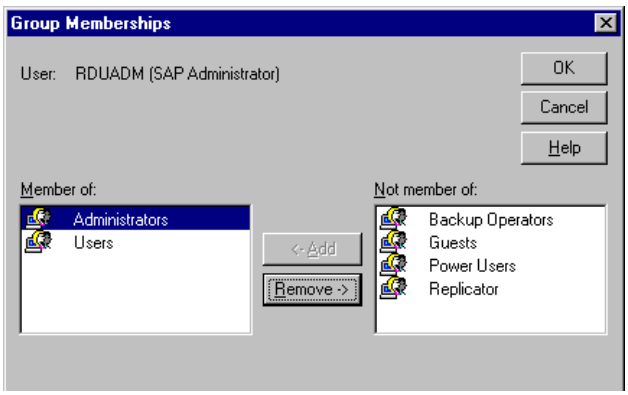


Figure 50. Add User to Group Administrators

8. You must create a home directory only for the <SAPSID>ADM user (RDUADM in our example). This is where the installation tools and logs will be kept. At least 20MB is required. The recommended directory is c:\users\<SAPSID>ADM. Do the following:
   - Click the **Profile** button on the new user screen.
   - Go to the Local Path field (see Figure 51).

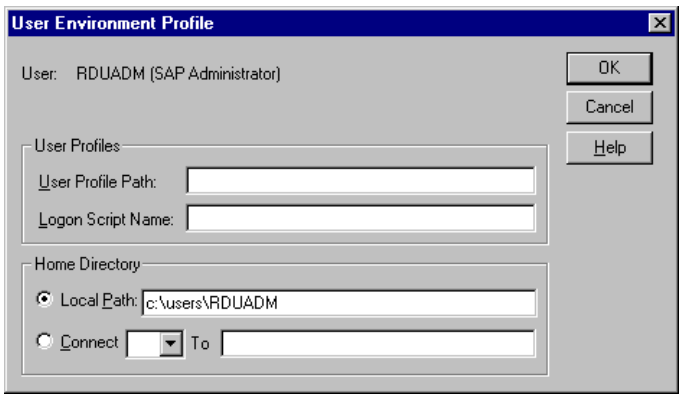


Figure 51. Assign Home Directory to <SAPSID>ADM

   - Enter `c:\users\<SAPSID>ADM` and click **OK**. (You may get an error message here stating that the directory could not be created. If so, create it manually.)
9. Click **Add** on the New User screen.
10. Repeat this process for user SAPService<SAPSID>.

3.2.2 Change Permissions for Home Directory

Change the permissions for c:\users\<SAPSID>ADM:

1. Start Windows Explorer.

2. Right mouse click on c:\users\<SAPSID>ADM.
3. Select **Properties.**
4. Click on the **Security** tab.
5. Click on **Permissions.**
6. Click on **Everyone.**
7. Change Type of Access to Full Control (see Figure 52).

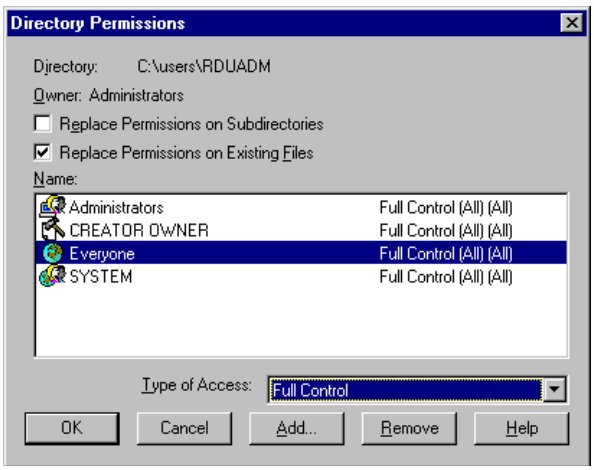


Figure 52. Change Permissions for Everyone

8. Click **OK** on the Directory Permissions screen.
9. Click **OK** on the Properties screen.

3.2.3 Add Right to Log on As a Service

Two SAP programs will be installed as a Windows NT service by the SAP install program R3INST. R3INST is covered in detail later. These service programs are automatically started by NT at startup, before a user logs on. The SAP Service account, SAPService<SAPSID>, starts these programs. You must grant SAPService<SAPSID> the right to log on as a service. This is done as follows:

1. Click **Start/Programs/Administrative Tools/User Manager for Domains.**
2. Click **User/Select Domain.**
3. Enter the local host name in the domain field. For example, our local host is itsosap1.
4. Click **Policies/User Rights.**
5. Check **Show Advanced User Rights.**
6. Scroll down the values and select **Log on as a service**. Then click **Add**. See Figure 53.

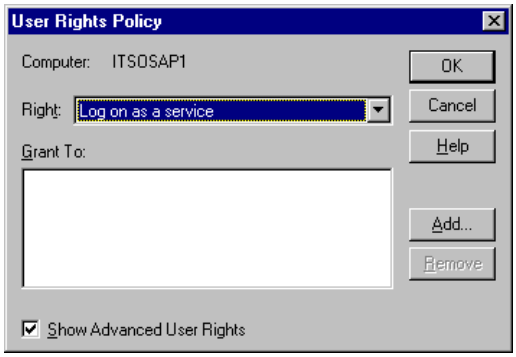


Figure 53. User Rights Policy

7. Click **Add** on the User Rights Policy screen.
8. Click **Show Users.**
9. Select **SAPService<SAPSID>** and click **Add**. See Figure 54.

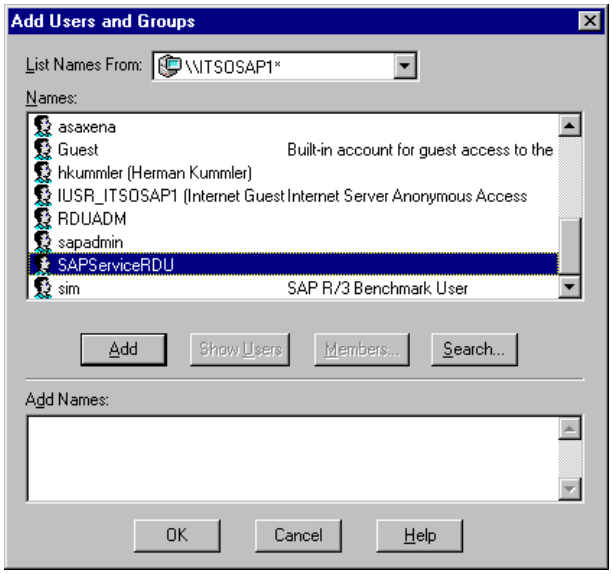


Figure 54. Add Log on As a Service Right to Sapservice<Sapsid>

10. Click **OK**, then **OK** again.
11. Exit User Manager.

3.3 Installing Oracle

This section describes the installation of Oracle Release 7.3.2 for SAP R/3 Release 3.1G. Oracle must be installed before SAP R/3. Every SAP instance, including the database instance, the central instance and application instances, requires Oracle components.

You will be asked the disk location you have planned for the Oracle home directory. This requires about 80 MB. The installation steps are:

1. Insert the Oracle RDBMS CD.

2. Start Windows NT Explorer.
3. Find the directory \Nt\Nt_x86\7322\Instal.l
4. Double-click on **install.exe.**
5. Click **OK** on the Language screen. You must take the default English_SAP as shown in Figure 55.

Figure 55. Oracle Installation Language

6. Enter your company name and the Oracle home directory as shown in Figure 56. and click **OK**.

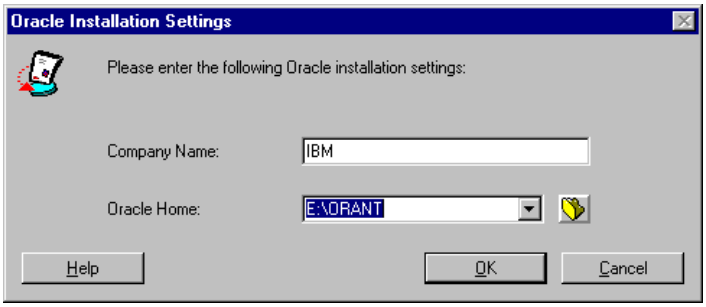


Figure 56. Oracle Installation Settings

7. Click **OK** on the Configuration screen (Figure 57). Oracle will be added to your path.

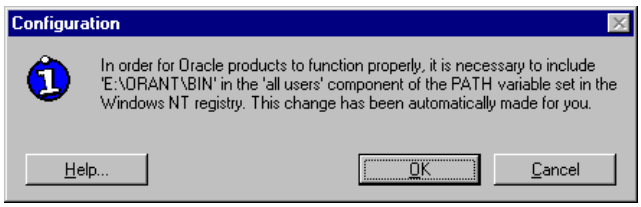

Configuration
In order for Oracle products to function properly, it is necessary to include 'E:\ORANT\BIN' in the 'all users' component of the PATH variable set in the Windows NT registry. This change has been automatically made for you.
Help...
OK
Cancel

Figure 57. PATH Change for Oracle

8. The Software Asset Manager screen (Figure 58) lets you choose the Oracle components to install.

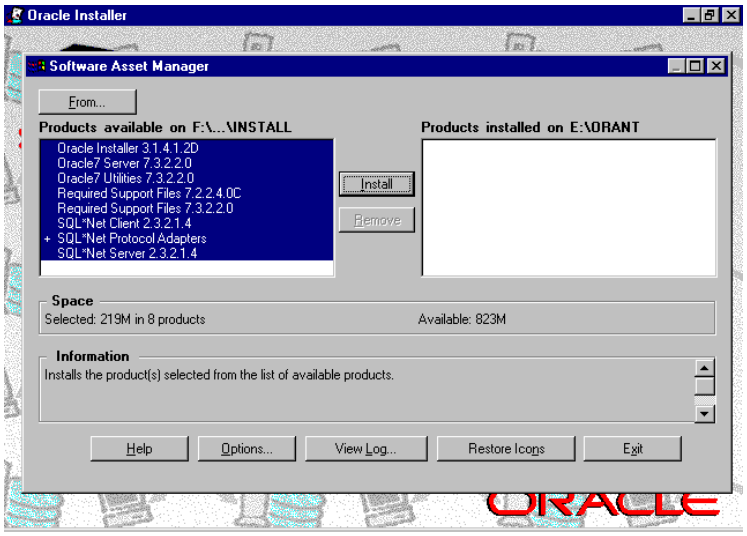


Figure 58. Select Oracle Products to Install

- If you are installing the database instance, click **Install** to install all selected products.
- If you are installing a dialog instance or central instance without database, select only:
  1. Required Support Files 7.3.2.2.0
  2. SQL*Net Client 2.3.2.1.4
  3. SQL*Net Protocol Adapters

9. Click **OK** on the Information screen about release notes.
10. Click **Exit** when you return to the Software Asset Manager screen (Figure 59).

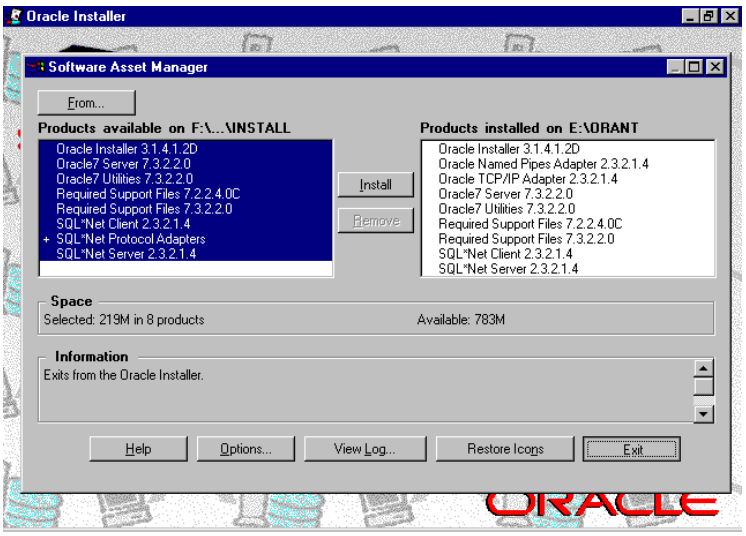


Figure 59. End of Oracle Install

11. Click **Yes** to confirm.
12. For central instance only, install Oracle patch:

1. Start Windows Explorer.
2. On the same Oracle CD find the directory \Nt\Nt_x86\Pat_7323\Install.
3. Double-click on **orainst.exe.**
4. Click **OK** on all screens.

3.4 Installing SAP R/3

3.4.1 Installing a Central Instance

The central instance must be installed first.

1. Log on as <SAPSID>ADM.
2. Insert the SAP Kernel CD.
3. Start Windows NT Explorer.
4. Go to the directory \Nt\I386.
5. Double-click on **R3inst.exe.**
6. Click **Continue.**
7. Enter the <SAPSID> you chose and click **OK** on the SID selection screen. For example, ours was RDU (Figure 60).

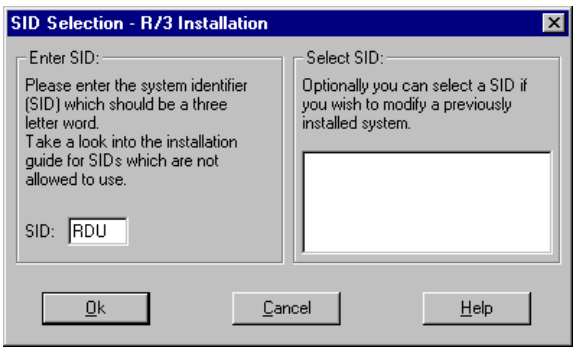

SID Selection - R/3 Installation
Enter SID:
Please enter the system identifier (SID) which should be a three letter word.
Take a look into the installation guide for SIDs which are not allowed to use.
SID:
RDU
Select SID:
Optionally you can select a SID if you wish to modify a previously installed system.
Ok
Cancel
Help

Figure 60. SAP SID Selection

8. Click **OK** on the installation directory screen.
9. Exit R3INST.
10. Click **Start/Programs/SAP R/3/R3INST** to restart R3INST.
11. Click **Continue.**
12. Click on your <SAPSID> and click **OK.**
13. Click **Server/New** after the local drives window appears.
14. Click on **Application Server** (Figure 61), then **OK.**

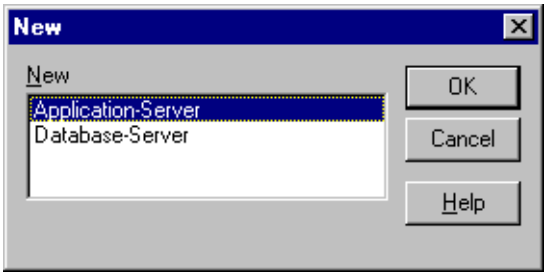


Figure 61. Choose Type of SAP Server

15. Select **Create a new central instance** and click **OK** (Figure 62).

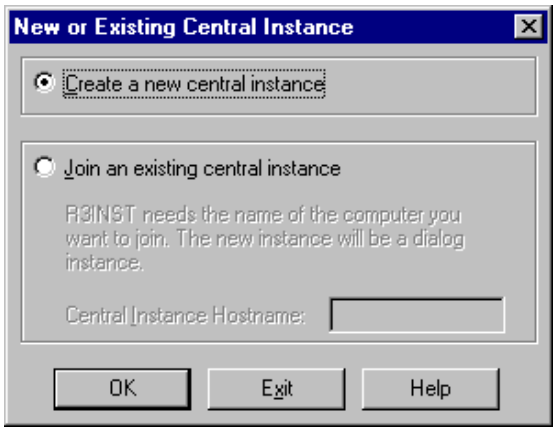

New or Existing Central Instance
Create a new central instance
Join an existing central instance
R3INST needs the name of the computer you want to join. The new instance will be a dialog instance.
Central Instance Hostname:
OK
Exit
Help

Figure 62. Creating Central Instance

16. On the Central Instance screen, leave the instance ID 0 and the memory equal to all the memory installed on your system. You should not have to change the hostname if you are planning to install the database on this central instance. See Figure 63.

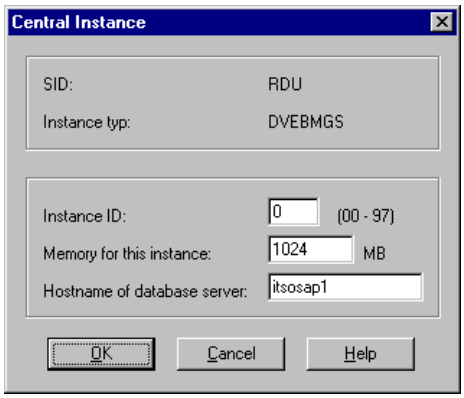


Figure 63. Central Instance Parameters

17. Enter `<DOMAIN>\SAPService<SAPSID>` in the Domain\Account field. If you are not using a domain, enter the host name instead. See Figure 64.

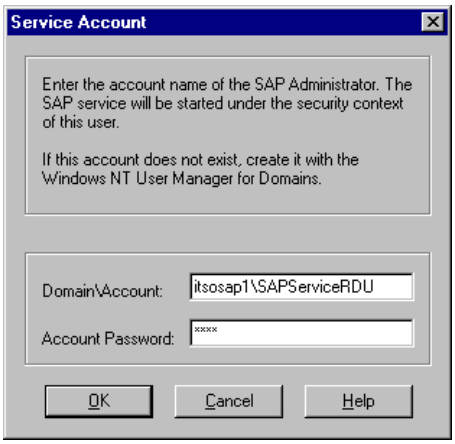

Service Account
Enter the account name of the SAP Administrator. The SAP service will be started under the security context of this user.
If this account does not exist, create it with the Windows NT User Manager for Domains.
Domain\Account:
itsosap1\SAPServiceRDU
Account Password:
****
OK
Cancel
Help

Figure 64. SAP Service Account

18. Assign disk drive letters to the SAP directories on the Required disk space screen. This is done by clicking on a line and typing the drive letter. Assign drive letters to all directories. (Planning for the allocation of SAP files is discussed in Appendix D, “SAP R/3 Sizing and Installation Planning” on page 141). See Figure 65.

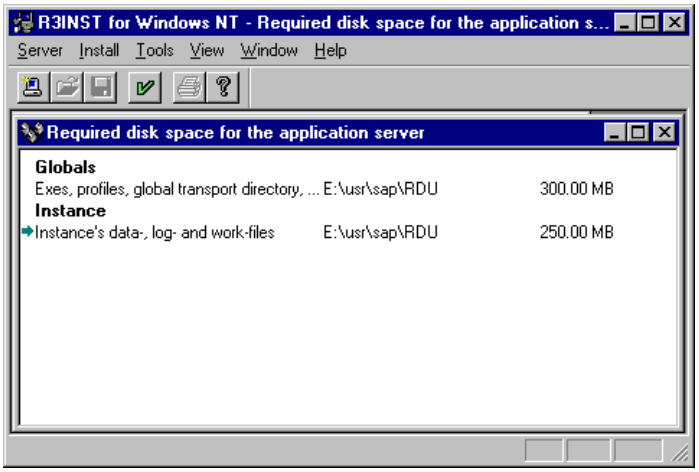

R3INST for Windows NT - Required disk space for the application s...
Server Install Tools View Window Help
Required disk space for the application server
Globals
Exes, profiles, global transport directory, ... E:\usr\sap\RDU 300.00 MB
Instance
Instance's data-, log- and work-files E:\usr\sap\RDU 250.00 MB

Figure 65. Assign Disk Drive Letters

19. Click **Install/Do i.**
20. After install is complete, exit R3INST.

3.5 Creating the Database

This section describes the creation of the SAP R/3 database. You will need the planning information from Appendix D, “SAP R/3 Sizing and Installation Planning” on page 141 because you need to assign disk drives for the database files that will be created.

3.5.1 Changing Defaults

The default tablespace sizes are contained in the file sapfs.inf in the install directory, c:\users\<SAPSID>\install. If you wish to increase the size of any tablespace or if you wish to use hardware mirroring, you must change this file with the SAP utility program SAPPAD. SAPPAD is like Notepad. Proceed as follows:

1. Start a command prompt.
2. Type cd \users\<SAPSID>\install.
3. Type sappad sapfs.inf.
4. If you want to use hardware mirroring, insert a semicolon before the lines mirrlogA and mirrlogB in the ORACLE-DB-SERVER section (see Figure 66).

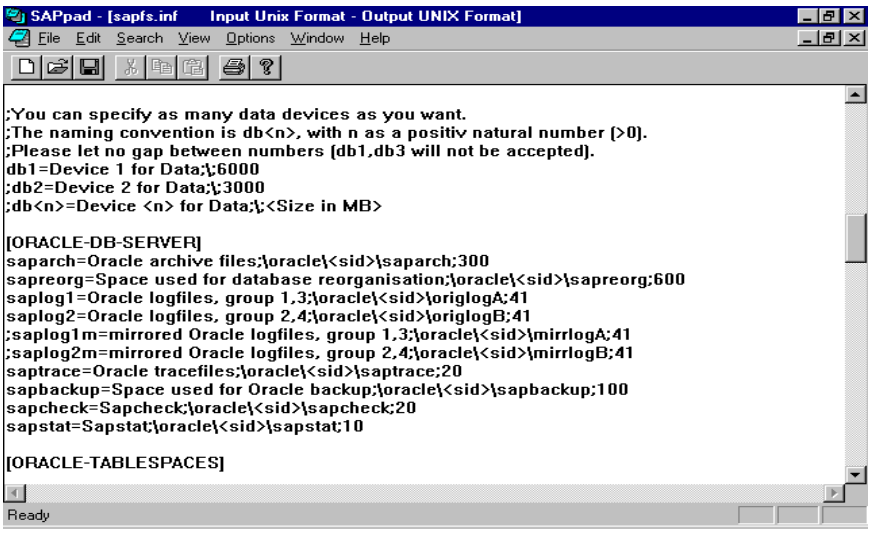

SAPpad - [sapfs.inf Input Unix Format - Output UNIX Format]
File Edit Search View Options Window Help
;You can specify as many data devices as you want.
;The naming convention is db<n>, with n as a positiv natural number (>0).
;Please let no gap between numbers (db1,db3 will not be accepted).
db1=Device 1 for Data;\;6000
;db2=Device 2 for Data;\;3000
;db<n>=Device <n> for Data;\;<Size in MB>
[ORACLE-DB-SERVER]
saparch=Oracle archive files;\oracle\<sid>\saparch;300
sapreorg=Space used for database reorganisation;\oracle\<sid>\sapreorg;600
saplog1=Oracle logfiles, group 1,3;\oracle\<sid>\origlogA;41
saplog2=Oracle logfiles, group 2,4;\oracle\<sid>\origlogB;41
;saplog1m=mirrored Oracle logfiles, group 1,3;\oracle\<sid>\mirrlogA;41
;saplog2m=mirrored Oracle logfiles, group 2,4;\oracle\<sid>\mirrlogB;41
saptrace=Oracle tracefiles;\oracle\<sid>\saptrace;20
sapbackup=Space used for Oracle backup;\oracle\<sid>\sapbackup;100
sapcheck=Sapcheck;\oracle\<sid>\sapcheck;20
sapstat=Sapstat;\oracle\<sid>\sapstat;10
[ORACLE-TABLESPACES]
Ready

Figure 66. Editing sapfs.inf

5. You can also increase, but not decrease, the sizes of database files.
6. After changes, click **File/Save**, then **File/Exit**.

3.5.2 Creating Oracle Database

This step could run for two to seven hours, depending on your processor and disk configuration. There are two CDs which contain the database. The R3INST program gives you the option of copying the 1st CD to disk so that the installation can run unattended after that. We recommend you choose that option. Proceed as follows:

1. Insert the CD DB Export 1 of 2.
2. Click **Start/Programs/SAP R/3/R3INST.**
3. Click on **Continue.**
4. Select your SAPSID and click **OK.**
5. When the local drives window appears (see Figure 67) , Click **Server/New.**

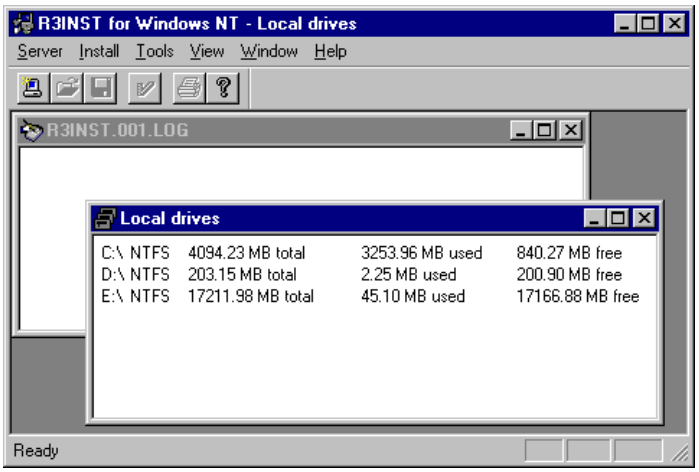

R3INST for Windows NT - Local drives
Server Install Tools View Window Help
R3INST.001.LOG
Local drives
C:\ NTFS 4094.23 MB total 3253.96 MB used 840.27 MB free
D:\ NTFS 203.15 MB total 2.25 MB used 200.90 MB free
E:\ NTFS 17211.98 MB total 45.10 MB used 17166.88 MB free
Ready

Figure 67. Local Drives

6. Select **Database-Server**, then click **OK.**
7. Select **Standard installation** from the installation window (see Figure 68).

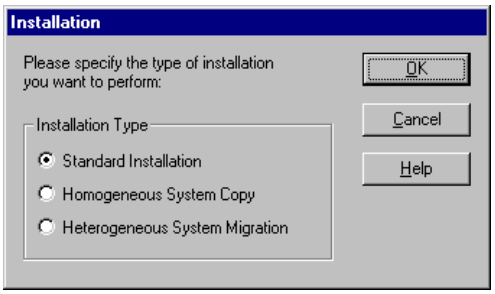


Figure 68. Database Installation Window

8. All the server options should be checked (see Figure 69).

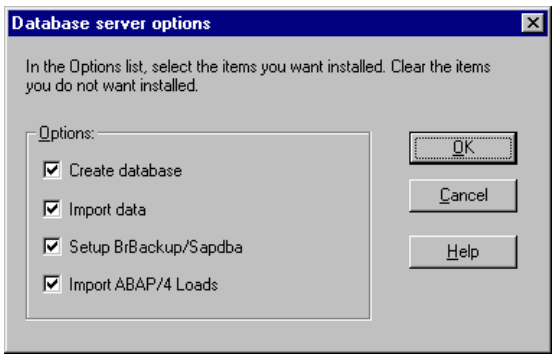


Figure 69. Database Install Options

9. Assign disk drive letters to the Database server directories and the Oracle tablespace sets on the Required disk space screen. This is done by clicking on a line and typing the drive letter. Assign drive letters to all directories. See Figure 70.

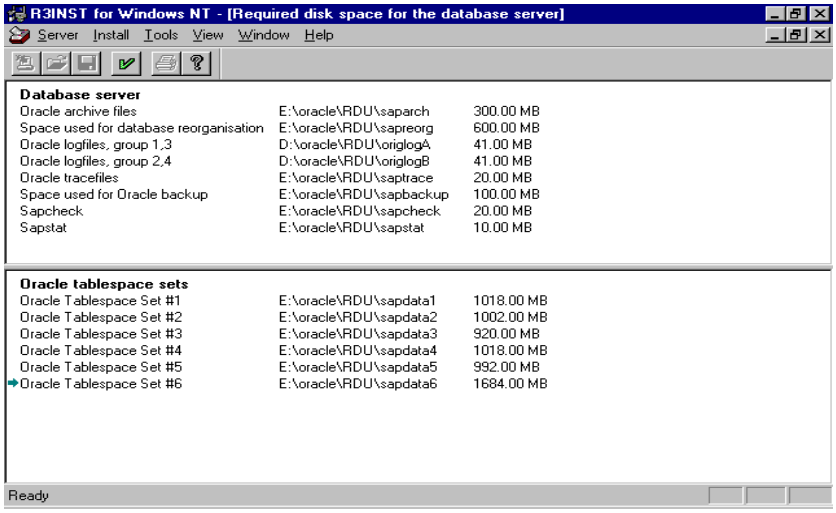

R3INST for Windows NT - [Required disk space for the database server]
Server Install Tools View Window Help
Database server
Oracle archive files E:\oracle\RDU\saparch 300.00 MB
Space used for database reorganisation E:\oracle\RDU\sapreorg 600.00 MB
Oracle logfiles, group 1,3 D:\oracle\RDU\origlogA 41.00 MB
Oracle logfiles, group 2,4 D:\oracle\RDU\origlogB 41.00 MB
Oracle tracefiles E:\oracle\RDU\saptrace 20.00 MB
Space used for Oracle backup E:\oracle\RDU\sapbackup 100.00 MB
Sapcheck E:\oracle\RDU\sapcheck 20.00 MB
Sapstat E:\oracle\RDU\sapstat 10.00 MB
Oracle tablespace sets
Oracle Tablespace Set #1 E:\oracle\RDU\sapdata1 1018.00 MB
Oracle Tablespace Set #2 E:\oracle\RDU\sapdata2 1002.00 MB
Oracle Tablespace Set #3 E:\oracle\RDU\sapdata3 920.00 MB
Oracle Tablespace Set #4 E:\oracle\RDU\sapdata4 1018.00 MB
Oracle Tablespace Set #5 E:\oracle\RDU\sapdata5 992.00 MB
Oracle Tablespace Set #6 E:\oracle\RDU\sapdata6 1684.00 MB
Ready

Figure 70. Assign Disk Drive Letters

10. Click **Install/Do it.**
11. Locate the file label.asc on the CD and click **Open.**
12. When prompted "`Do you wish to copy the contents of the 1st Export CD to hard disk`", click **Yes** (see Figure 71).

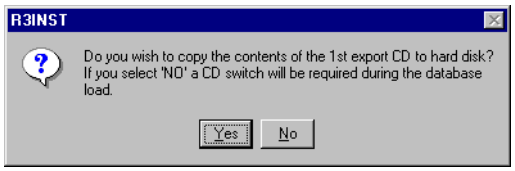

R3INST
Do you wish to copy the contents of the 1st export CD to hard disk?
If you select 'NO' a CD switch will be required during the database load.
Yes
No

Figure 71. Copy Export CD 1 To Disk

13. After the first CD is copied, you will be prompted to locate the file label.asc on the second CD.
14. Insert the second DB Export CD.
15. Locate the file label.asc on the CD and click **Open** (see Figure 72).

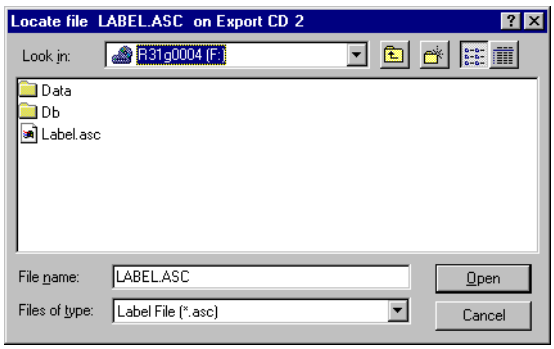


Figure 72. Locate label.asc on CD 2

16. A log file will be displayed (see Figure 73). This file is in c:\users\<SAPSID>\install and can be viewed later. This is the step that will take several hours.

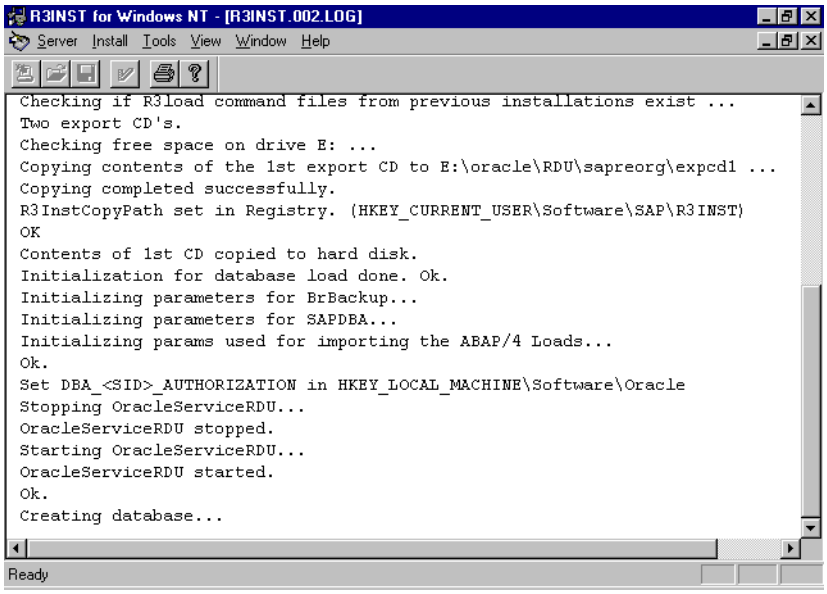

R3INST for Windows NT - [R3INST.002.LOG]
Server Install Tools View Window Help
Checking if R3load command files from previous installations exist ...
Two export CD's.
Checking free space on drive E: ...
Copying contents of the 1st export CD to E:\oracle\RDU\sapreorg\expcd1 ...
Copying completed successfully.
R3InstCopyPath set in Registry. (HKEY_CURRENT_USER\Software\SAP\R3INST)
OK
Contents of 1st CD copied to hard disk.
Initialization for database load done. Ok.
Initializing parameters for BrBackup...
Initializing parameters for SAPDBA...
Initializing params used for importing the ABAP/4 Loads...
Ok.
Set DBA_<SID>_AUTHORIZATION in HKEY_LOCAL_MACHINE\Software\Oracle
Stopping OracleServiceRDU...
OracleServiceRDU stopped.
Starting OracleServiceRDU...
OracleServiceRDU started.
Ok.
Creating database...
Ready

Figure 73. R3INST Log File

17. After the database load, insert the Report Load CD.
18. Locate the file EXNTI000.TOC in the DATA directory and then click **Open** (see Figure 74). This step takes about 10 minutes.

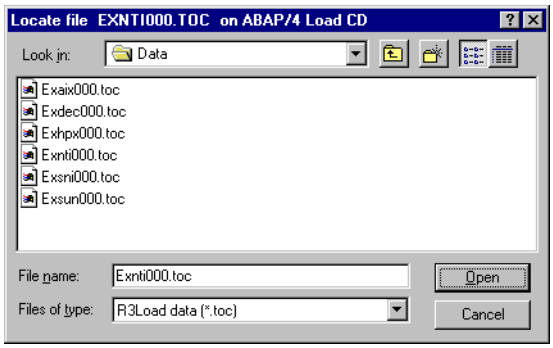


Figure 74. Locate File on Report Load CD

19. Exit R3INST.

3.6 Starting SAP R/3

To start SAP:

1. Click **Start/Programs/SAP_R3/SAP ServiceManager for <SAPSID>_<Instance>.**
2. Click on **Start** button.
3. When the system is up, two green lights will appear (see Figure 75).

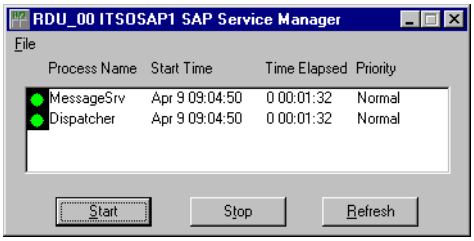


Figure 75. Starting SAP

To stop SAP:

1. Click **Stop** on the Service Manager window (this does not stop the database).
2. Go to a command prompt.
3. Enter `sapdba -shutdown` to shut down the database.

3.7 Installing an Application Server

To install an application server or dialog instance, proceed as follows:

1. Install the required components of Oracle as described in 3.3, “Installing Oracle” on page 93.
2. Insert the SAP Kernel CD.
3. Click **Start/Programs/R3INST** and click **Continue.**
4. Choose your SAPSID and click **OK.**
5. At the Local Drives screen, click **Server/New.**
6. Choose **Application Server** and click **OK.**
7. Select **Join an existing central instance.**
8. Enter the host name of the central instance and click **OK**.
9. Take the defaults for Instance ID and memory and verify central instance host and database host.
10. Enter the name of the SAP service account as shown in Figure 76.

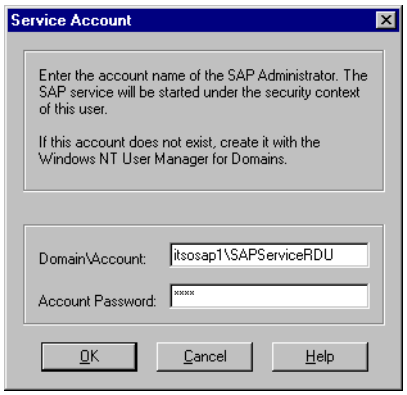

Service Account
Enter the account name of the SAP Administrator. The SAP service will be started under the security context of this user.
If this account does not exist, create it with the Windows NT User Manager for Domains.
Domain\Account:
itsosap1\SAPServiceRDU
Account Password:
*****
OK
Cancel
Help

Figure 76. SAP Service Account

11. Assign disk drives by clicking on a line and typing a drive letter.

12. Click **Install/Do it.**

13. After message "`Installation of application server finished`" (see Figure 77), exit R3INST.

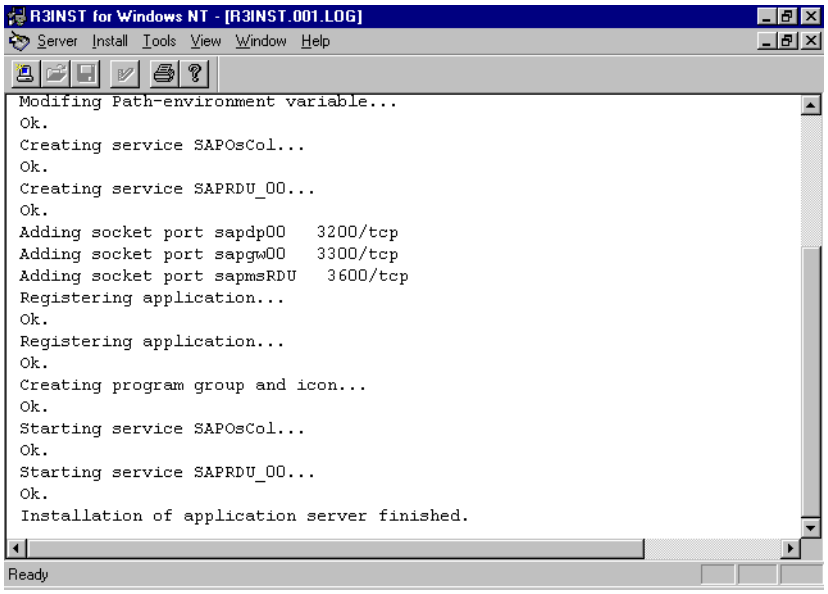


Figure 77. Application Server Installation Log

3.8 Post-installation Items

There are several additional steps that are required after the database, central instance, and application servers are installed. Please refer to the SAP installation manual in the section called "Completing and Checking the SAP Software Installation". These steps include:

- Installing the SAP GUI front end software
- Installing the SAP license
- Initializing the transport system for changes
- Setting up a printer
- Copying a client
- Logging on to OSS
- Backing up the system

Chapter 4. IBM's Software Products that Complement SAP R/3

In this chapter, we discuss IBM's commitment to Windows NT and the various software products available on Windows NT from IBM that complement SAP R/3.

4.1 IBM's Commitment to Windows NT

When IBM first announced it would deliver much of its software on Windows NT, plenty of eyebrows shot up, because IBM and Microsoft have long been in direct competition and now they would be cooperating.

Despite the skepticism, the two software giants have confounded critics by forging a relationship around Windows NT that goes beyond their mutual interest in the Win32 APIs.

Though they compete fiercely in some industry sections, IBM and Microsoft also realize that it is in their best interests to cooperate in other areas. Throughout this cooperative relationship, each has shown respect for the other's design and programming skills in the liaison between the two companies that has arisen from IBM's focus on Windows NT.

The primary point of interaction between IBM and Microsoft is at IBM's Kirkland Programming Center and within IBM's Windows NT System Management Organization. Lotus and Tivoli also maintain productive technical relationships with Microsoft.

IBM founded Kirkland in 1993. Kirkland's primary aim has remained the same -- to ensure that IBM hardware and software work seamless with Microsoft products. In addition to its hardware optimization role, the Kirkland Programming Center also plays a leadership role in ensuring IBM's software on Windows NT qualifies for the Designed for BackOffice logo. This accreditation communicates to IBM's customers that IBM software for Windows NT conforms to Microsoft's standards for excellent integration into the Windows NT environment. To date, eleven IBM products, including those providing database, communications, queuing and directory, and distributed security functions, have this accreditation.

4.2 IBM and Windows NT 5.0

Through IBM's Windows NT System Management Organization, the IBM laboratories are participating in the Windows NT 5 early adopters program. Microsoft calls this the FirstWave Program. As a result of this relationship, IBM obtains regular builds of Windows NT 5, and IBM receives the technical support necessary to ensure that IBM software exploits Windows NT 5 functionality in a first class manner.

In fact, IBM and Microsoft have signed an agreement articulating the integration points that IBM will exploit in Windows NT 5. Explains Pat Gibney, Windows NT System Manager for IBM, "Ours is a working relationship founded on mutual respect for each other's technical talent and a shared interest in making the most of the Windows NT technologies." On a regular basis, the technical staffs of both companies attend meetings and participate in conference calls to discuss

© Copyright IBM Corp. 1998

collective issues. IBM also receives detailed technical support and is included in all Microsoft education and training programs for Windows NT 5.

4.3 Overview of IBM's Software that Complement SAP R/3

IBM and Lotus offer more than 100 Windows NT solutions. They offer a growing resource to corporate developers, independent software vendors and business partners for creating enterprise-class business solutions on NT and taking advantage of network computing.

4.3.1 The UDB DB2

DB2 technology is a proven winner in any world, including Windows NT. This server software stores, manages and retrieves data. It operates according to defined rules for security, multiple user access and data management. No matter how large or small your Windows NT world may be, DB2 makes your data safe, secure and easily accessible. Now, do you want to weave in audio, video, graphics, text and other non-traditional data types? DB2 handles it all with ease.

4.3.2 Visual Warehouse - the Datamart Builder for NT

Like a DataWarehouse a datamart contains informational data optimized for enduser decision making and data analysis. With Visual Warehouse you can quickly build a datamart that leverages the use of your existing data for example, to pull information out of Oracle, Sybase, SQL server and Informix and merge with host data from VSAM, DB2 or flat files. With built in job scheduling and extract capability, the datamart is ready for use with your favorite query and reporting tools.

4.3.3 Net.Data

Net.Data is IBM's strategic product for enabling Internet/intranet access to relational data on a variety of platforms. All of the most prevalent databases can be data sources for your Web application: DB2, Oracle, Sybase, ODBC data sources as well as flat file data. Net.Data provides for high performance, robust application development function, and exploitation of existing business logic. Net.Data tightly integrates with Web-server interfaces, providing higher performance than common gateway interface (CGI) applications. Net.Data supports client side processing, server side processing with Java, REXX, Perl and C++, conditional logic and a rich macro language.

4.3.4 DataPropagator Relational

Designed to meet copy needs in the relational environment for operational and informational applications, IBM DataPropagator Relational replicates data throughout databases in the DB2 family, and provides powerful copy capabilities that support data distribution, data consolidation, and data enhancement to help you reengineer business processes and improve decision-making effectiveness.

4.3.5 IBM MQSeries

MQSeries for Windows NT brings business worlds together with reliable and transparent integration between Windows NT and 20 other major computing systems. With this award-winning software, you can integrate newly developed NT applications into larger networks no matter how many platforms or network

protocols are involved. You'll cut development and maintenance costs, deploy business solutions faste, and gain a greater return on that hefty investment you've made in systems and resources.

4.3.6 ADSTAR Distributed Storage Manager (ADSM)

Searching the heavens for enterprise-wide storage management? All worlds fall easily into orbit around ADSM. It supports the broadest range of platforms, devices and protocols. You can count on super-reliable automated backup and recovery, archiving, hierarchical storage management and disaster recovery for a safer world for all your data. ADSM provides proactive data protection across your business' many computing worlds. Whether you want a single server or an entire, far-flung enterprise, ADSM can take you there.

Note:

For more details on ADSM, please refer to 4.4, "SAP R/3 Data Solutions using IBM ADSM" on page 109.

4.3.7 Net.Commerce

Now you can profit from secure electronic shopping around the globe. You can rack up sales around the clock. And build stronger customer relationships by the minute. Make selling on the Internet a reality with Net.Commerce. This comprehensive software package from IBM makes setting up virtual storefronts on the Net as easy as it is safe. Net.Commerce gives you the flexibility to showcase your products any way you want. And then it enables immediate, super-secure online transactions.

4.3.8 IBM VisualAge

Develop applications faster with IBM's powerful family of VisualAge products. Your development teams will take advantage of more intuitive visual programming with a robust set of tools in all the familiar C++, Smalltalk, COBOL and Basic environments. Developers can then port these applications over to other platforms without having to hassle with complex system interfaces.

The following are the various application development tools for Windows NT:

- VisualAge e-business
- VisualAge for Java
- VisualAge C++
- VisualAge Basic
- VisualAge Smalltalk
- VisualAge Generator
- VisualAge COBOL
- VisualAge RPG
- VisualAge DataAtlas
- VisualAge TeamConnection
- VisualAge WebRunner

- IBM Component Broker
- Lotus Bean Machine

4.3.9 Lotus Domino

Here's the first application and messaging server that allows you to take advantage of secure, interactive business solutions for the Internet and intranet. You can quickly build, deploy and manage applications to bring co-workers, partners and customers together. Domino provides support for a variety of clients and devices, including Web browsers, Notes clients, and POP3 mail clients.

4.3.10 Lotus Notes

Notes is the world's leading software solution that combines messaging, groupware and the Internet. With Domino and Notes, you can effectively store, manage and distribute information because it is the central access point for finding and sharing the information that you need, whether it is located in e-mail, relational databases, or host-based systems, in your favorite desktop application or on the Internet.

4.3.11 Tivoli Enterprise

Now, for the first time, you can combine the successful management of Windows NT, UNIX, NetWare, host environments, even right down to the desktop, with a single enterprise-scale solution. Completely integrated with the current Tivoli Enterprise product set, this revolutionary management solution extends the full power of Tivoli Enterprise to the Windows NT environment. Tivoli Enterprise for Windows NT is the first and only integrated suite of systems management applications designed specifically to take on the truly distributed computing environment.

Note:

For more details on Tivoli, please refer to 5.2, “Tivoli Enterprise Module for R/3” on page 114.

4.3.12 eNetwork Communications Suite

IBM eNetwork Communications Suite delivers complete, easy access to all of your corporate intranets and host data, Lotus Notes, and the Internet. Communications Suite combines the power of IBM eNetwork Personal Communications client communication products, Lotus Notes Mail, FTP Software TCP/IP applications, Web browsers from Netscape and Microsoft, and Netscape Navigator-compatible plug-ins. This single powerful package gives you access to your information wherever it resides.

4.3.13 eNetwork Host On-Demand

IBM eNetwork Host On-Demand uses the power of Java to open the doors of your enterprise data whenever and wherever you need it, straight from your browser. A single click launches a distinct Java applet that gives you broad access to your intranet data, with TN3270, TN5250, and VT 52/100/220 emulation in a single package.

4.3.14 DataJoiner

A new class of data access middleware. DataJoiner is a multi-database server that offers your business an unprecedented level of data access. With DataJoiner you view all your data--IBM and multi-vendor, relational and non-relational, local and remote--as though the data were local. You'll be able to access and join tables located across multiple data sources with a single SQL statement, even without knowing the location of each source.

4.3.15 IBM Flowmark

Reengineering or managing your business processes is essential to staying competitive. IBM FlowMark is the workflow management product that can help you do it. It lets you design, refine, document and control your business processes. You can expect significant cycle time reductions and improvements in process consistency and quality. FlowMark offers a powerful integration platform for all types of applications, such as personal productivity tools and customer's own applications for the workstation and the mainframe.

4.4 SAP R/3 Data Solutions using IBM ADSM

The ADSM family of software products is an enterprise-wide solution that integrates automated network backup and archive with storage management and powerful disaster recovery planning functions. ADSM provides centrally controlled, highly automated network-based backup, archive and space management. With support for a variety of platforms and protocols, ADSM is an ideal enterprise-wide storage management tool for all your backup and restore requirements. Yet, ADSM's scalability helps make it economical for single sites as well as for global enterprises.

A Complete Storage Management Solution: ADSTAR Distributed Storage Manager(ADSM) combines automated network backup and archiving with disaster recovery support - including off-site tape management, data migration through an ADSM storage hierarchy, and tape media space management - providing an easy-to-use, scalable data protection solution that is fully integrated with SAP R/3.

Optimized Resources: By automating data protection tasks, ADSM increases the productivity of your administrative staff and system resources. This enables system administrators to manage larger volumes of data while having more time to focus on other important activities.

Minimized Downtime: ADSM backs up SAP R/3 databases while they are online, virtually without impacting business operations. Thus mission-critical applications that must be available 24 hours a day can still be securely backed up.

Fast Recovery after Disaster: Two aspects of ADSM enable very fast recovery after a failure - the program and the process. Not only is the ADSM technology fast, but its clear operational procedures enable system administrators to work quickly and effectively even during the stressful period of a recovery operation.

Support for Multiple Platforms: ADSM includes a family of products that support a broad range of IBM and non-IBM client and server operating systems, databases, and storage devices. Backup data can be stored on any ADSM

Version 2 or Version 3 server platform, which can be different from the database platform.

4.5 ADSM and SAP: A Powerful Combination

ADSM integrates with both your SAP R/3 system and your database tools, enabling the entire environment to be backed up, including database files such as executables, control files, and user data. IBM's SAP R/3 database backup and recovery solution includes the following building blocks:

- Database-specific administration utilities for Oracle, Informix, DB2, and Microsoft SQL Server databases
- An interface agent between the database and the ADSM
- A client to backup/restore SAP R/3 non-database files using ADSM's incremental backup/restore functions

4.6 Flexible SAP R/3 Protection

ADSM can be configured to use your existing infrastructure and resources efficiently. ADSM can help safeguard Oracle, DB2, and Microsoft SQL Server databases in an SAP R/3 environment through each database's backup/restore utilities. ADSM also supports ADABAS databases in an SAP R/3 environment through a special service offering (ADINT/ADSM) that interfaces with ADABAS's utilities.

A variety of techniques can be used with ADSM to help protect an Oracle database in an SAP R/3 environment. The first is SAP's Oracle Backup tool. IBM Backup/Restore Interface for Oracle for SAP R/3 (BACKINT/ADSM) seamlessly integrates the SAP R/3 Oracle database backup/restore administration utilities (SAP BRBACKUP and BRARCHIVE) with ADSM. SAP BRBACKUP and BRARCHIVE provide a list of data to be backed up to BACKINST/ADSM. Then BACKINT/ADSM sends the list to one or more ADSM servers. Certified by SAP, this solution for Oracle databases provides the following capabilities:

- Online/offline backup for SAP R/3 databases, log files, redo logs, and system-direct restore
- High-speed backup/restore through parallelism
- Automatic management of saved backups, storage devices, and media
- Alternate backup paths can improve performance and enable backups to continue even when there are problems on the network

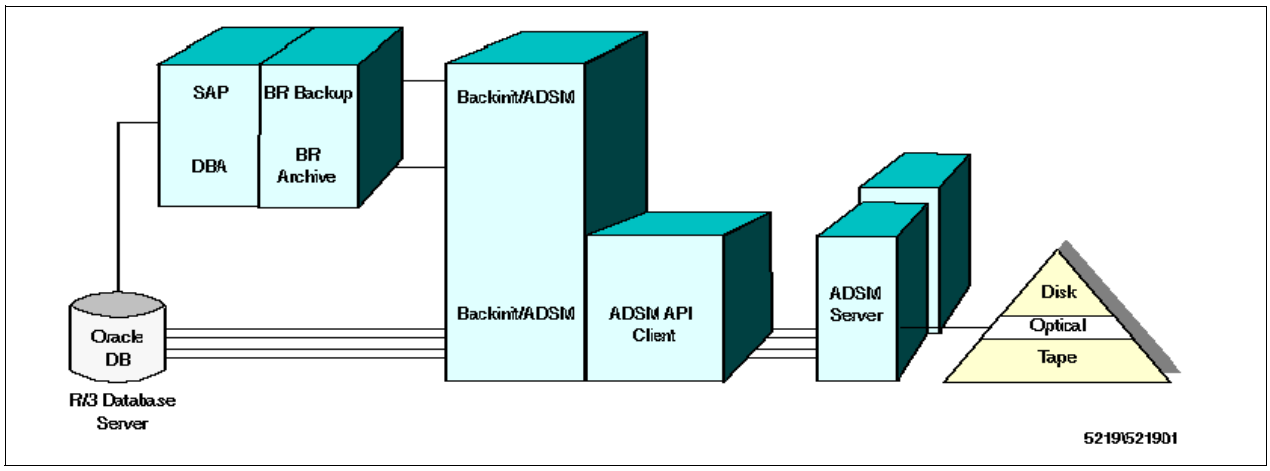


Figure 78. Backup/Restore of SAP R/3 System using ADSM

In addition to SAP's Oracle tools, ADSM supports other Oracle backup and restore techniques, including Oracle's Enterprise Backup Utility(EBU), Oracle8 Recovery Manager(RMAN), and BMC Data Tool's SQL-BackTrack. For additional details about all of the Oracle ADSM backup techniques, see the redbook *Using ADSM to Back Up Databases,* SG24-4335.

4.7 SAP R/3 and Archiving

ADSM is more than a backup/restore product. It also provides advanced storage management functions, including operation with SAP R/3's archive functions. ARCHINT/ADSM provides advanced solutions for databases in an SAP R/3 environment. For example, SAP R/3 can extract or archive older inactive data from a database and store it on an SAP R/3 application server. You can use ARCHINT/ADSM to manage that data on an ADSM server. ARCHINT/ADSM can also manage other SAP R/3 data such as print lists, outgoing documents, local files, and incoming documents from either the SAP R/3 application or presentation servers.

Chapter 5. SAP R/3's System Management

This chapter provides a brief overview of SAP R/3's systems management and Tivoli's Module for SAP R/3.

5.1 The Computing Center Management System (CCMS)

The CCMS is the SAP R/3 system management solution. It is available as a standard tool. Since in a client/server environment the different components are spread over several hardware servers, it is important to have a systems management tool.

CCMS comprises System Monitoring and Systems Management. As the system management tools can be used from any SAP R/3 client, there is no need for a central console. System administrator can view the current state of the R/3 environment and run every system management task from every front end.

SAP R/3 provides MIB-based SNMP interface through which all relevant information related to tasks,events etc. is made public and hence products like Tivoli Management software can use it to monitor an R/3 system. The core components of the CCMS are tools for the following:

- System and performance management
- Database and archiving management
- Workload management
- Output management
- Security management

The CCMS is open to external system management tools like Tivoli Module for R/3 by making use of the CCMS System Management APIs, which allow integration of R/3 system administration with Tivoli.

5.1.1 What's New in CCMS in SAP R/3 Release 4.0

There is a new monitoring architecture in Release 4 of R/3 under which each resource inside or outside of R/3 can be instrumented with a *data supplier*. A data supplier is nothing but a program that collects information. If it detects an abnormal condition, it triggers an alert, which can be handled automatically by the system or by the administrator. Alerts can be filtered and dispatched according to administrative role or problem area. The alert infrastructure can be extended by using a programming interface. Multiple R/3 systems can be monitored.

The SAP R/3 systems can be reconfigured on the fly without shutting down; for example, from dialog-intensive operation during the day time, you may switch over to background-intensive processing at night. CCMS also provides a tool to track and check the startup and system profiles, called the profile maintenance tool. CCMS also provides you graphical control tools to view logs, start or stop servers, check users, etc. CCMS also provides tools to monitor system and business statistics.

© Copyright IBM Corp. 1998

5.1.2 Database and Archiving Management

A majority of the database administration tasks can be performed within R/3 from the CCMS. *CCMS Database Planning Calendar* can schedule and track the results of online and offline database backups, log backups, and other operations. A database monitor has been also added to monitor in-depth analysis. Oracle and Informix databases can also be managed using CCMS's SAPDBA program.

R/3's archiving services allows you to keep the online portion of your database small and manageable, while still providing reporting and direct access for each major R/3 business object. Also,you may develop your own archiving programs by using Archiving Development Kit (ADK).

CCMS implements mechanisms to balance workload in performance-critical areas such as the following:

- Logon Workload
- Output Workload
- Background Processing

CCMS also handles output management (printing/spooling), security management and user validation and authorization.

5.2 Tivoli Enterprise Module for R/3

The Tivoli Enterprise Module for R/3 offers the best in deployment, consolidation, and automation in administering large SAP R/3 sites. The module maximizes your R/3 investment by providing greater control of this complex application. It provides centralized management of multiple remote sites and reduces daily administrative management tasks. The Tivoli Enterprise module for R/3 ensures consistent, reliable and cost-effective management.

5.2.1 Managing Multiple Instances of R/3

The Tivoli Enterprise Module for R/3 is specifically designed to manage SAP R/3. It allows you to control multiple R/3 servers and applications from a central site. It lets you deploy R/3 rapidly and correctly, automate responses to R/3 events, and consolidate system alarms from multiple remote R/3 sites to a single point of control. The Tivoli Enterprise Module for R/3 offers critical management capabilities for the application server and client components on an SAP R/3 system.

SAP R/3 system consists of the following:

- A database (typically an Oracle or SQL Server or DB2)
- A series of application servers
- Clients, with a GUI to connect to the server and to the database

5.2.2 Managing R/3 Application Servers and Database Servers

The Tivoli Enterprise Module for R/3 offers a Tivoli Enterprise Console for each application server. The monitoring collection is preconfigured to send both CCMS (Computing Center Management System) and Sentry-captured events to the console, which serves as a mission control point for the entire enterprise. The complete layout of how Tivoli Module for R/3 is implemented is shown in Figure

79. The module greatly simplifies the R/3 administrator's job by correlating all events generated by multiple SAP R/3 instances into one centralized console, offering an unparalleled view of the entire R/3 environment. This gives SAP administrators unprecedented control over their R/3 systems.

5.2.3 Client Installation and Configuration

The main difficulty in managing large numbers of heterogeneous R/3 clients is installing and deploying the SAP R/3 graphical user interface(GUI). The Tivoli module for SAP R/3 offers Tivoli Enterprise software distribution file packages to deploy this GUI to clients across the enterprise. This capability greatly simplifies one of the most time-consuming chores connected with the R/3 management.

Administrators can correctly, consistently, and reliably install the R/3 client interface from one centralized location even to remote user sites that don't have their own system administrators.

In addition, it enables new installs from the SAP R/3 CD. The module allows an SAP consultant to install and configure an SAP client for each class of end user and client type. The consultant can then distribute this *snapshot* configuration to as many clients as desired, saving effort and consultation costs.

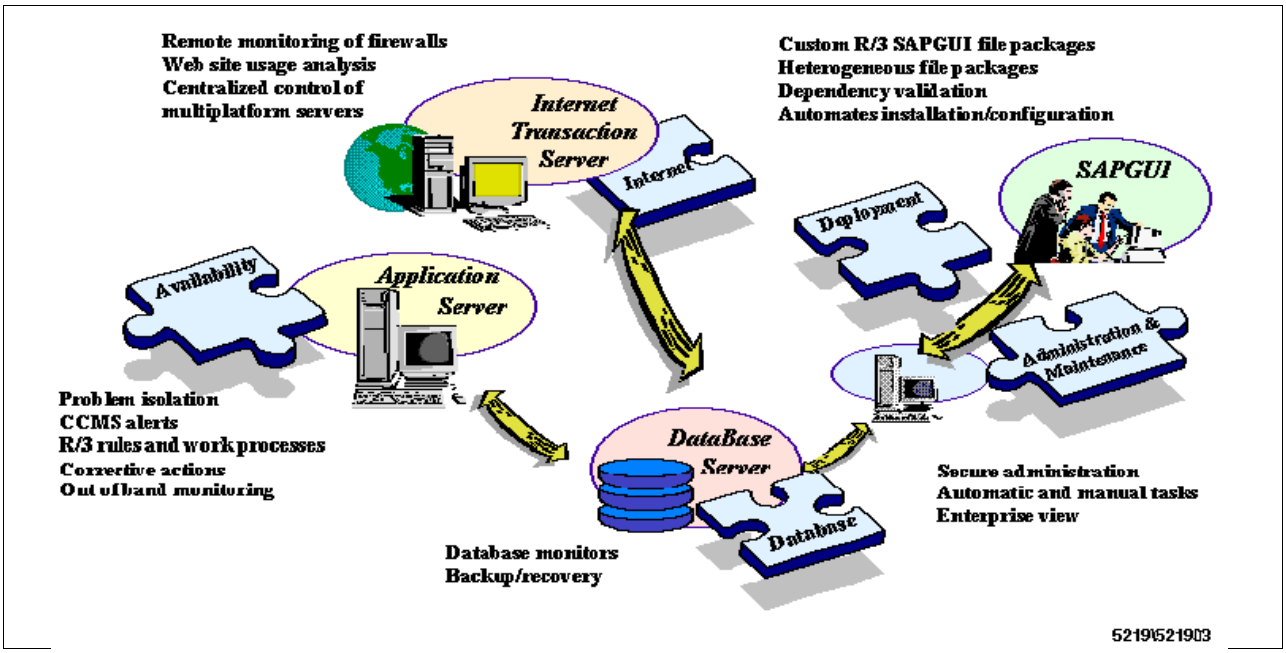


Figure 79. The Tivoli Module for SAP R/3

5.2.4 Automation of SAP R/3

Automating R/3's complex operations is a key component of the Tivoli Module for R/3. Administrators can leverage their expertise in R/3 by using the module's extensive awareness of SAP events and by defining rules that handle these events. The module allows administrators to suppress harmless messages and alerts that occur during an SAP mode shift or during the start and stop of an application or database server.

When R/3's shared memory segment generates a less-than-helpful message, the module will *drill down* to provide more meaningful data to administrators. This ability makes diagnosis and remedy of problems much easier.

When R/3 provides a single alert, such as a *yellow alert* and then doesn't display subsequent alerts of the same level, the module acknowledges the first alert and displays the additional alerts. This gives the administrator a more accurate view of the SAP environment.

5.2.5 Introducing the Module Functions

The Tivoli Enterprise Module for SAP R/3 makes it easier for you to manage SAP R/3 installations. The following functions are provided:

- Availability management
- Task libraries
- Automated R/3 client installation
- Security enhancements
- Extensibility
- R/3 release compatibility

5.2.6 Availability Management

The R/3 Computing Center Management System (CCMS) contains a set of alert monitors that monitor critical elements of the R/3 system and notify administrators of potential problems. CCMS provides some of this information through its System Management (SysMan) interface, also known as its MIB interface. The R/3 SysMan can be queried using R/3 libraries provided by SAP.

5.2.7 TEC Event Adapter for the R/3 MIB

The Module for R/3 provides a Tivoli Enterprise Console (TEC) event adapter for querying the R/3 MIB and translating the R/3 alert traps into TEC events.

5.2.8 Monitor Collections

The Module for R/3 supplies a set of monitor collections that provide out-of-band monitors for the R/3 application server. These Tivoli Enterprise Distributed Monitoring collections provide a wide range of internal and external R/3 monitors, such as monitoring performance statistics from the R/3 MIB, or monitoring internal R/3 buffer statistics by using the R/3 Remote Function Call (RFC) interface. Configurable thresholds and responses enable proactive monitoring and automatic creation of differing severity levels of TEC events.

5.2.9 Tivoli Enterprise Console (TEC)

The TEC provides a consolidated event view for each R/3 system, including database servers, all application servers, and designated clients if desired. The TEC is extremely configurable and can be created and configured for any number of R/3 administrators and R/3 systems.

5.2.10 TEC Event Server Rule Base

The TEC event server rule base provides intelligent event processing and correlation. The Module for R/3 provides rule sets that enable the following functions:

- Duplicate event checking
- Automatic closing of harmless events
- Automatic drill-down
- Bidirectional communication
- Event correlation
- Enhanced syslog event processing
- Heartbeat processing
- Bidirectional Communication

By converting R/3 MIB alerts into R/3 internal alerts, the TEC event server rule base can use the RFC interface to control R/3 alerts from the TEC. For example, closing or acknowledging an R/3 internal alert from the TEC automatically causes the R/3 alert to be reset or acknowledged in the appropriate R/3 application server.

5.2.10.1 Event Correlation

The TEC event server rule base correlates certain types of events and takes the appropriate action. For example, the TEC event server rule base automatically resets R/3 buffer alerts for 35 minutes after receiving an R/3 stated change event. This gives the buffers time to reset cache quality without inappropriately requesting administrator assistance for an unavoidable but inconsequential event. Another example is the ability to identify that the R/3 system is unavailable and to therefore automatically drop out-of-band monitor events. This avoids the irritating situation that often accompanies taking a closely monitored production system offline.

5.2.10.2 Enhanced Syslog Event Processing

Because it is desirable to know each type of critical syslog event and not just the highest severity level, the TEC event server rule base converts the R/3 MIB syslog alert into an R/3 internal alert and then automatically resets the R/3 CCMS syslog alert. In this manner, the R/3 administrator is able to view each type of critical syslog event as it occurs.

5.2.10.3 Heartbeat Processing

This function of the Module for R/3 provides you with another out-of-band system monitoring capability. If the TEC event adapter sends a heartbeat, the TEC event server rule base sets a timer rule that expects to receive another heartbeat before the specified interval. In this manner, the TEC event server closely monitors the availability of the R/3 system.

5.2.10.4 Multi-Region Support

The TEC event server rule base optionally provides event forwarding for enabling the consolidation of events from multiple Tivoli Management Regions (TMRs). By enabling this function, a single administrator can monitor and manage a large number of R/3 systems in different TMRs.

5.2.10.5 Automatic Diagnostics Framework

The combination of the TEC automated tasks, the Module for R/3 tools, and the R/3 RFC interface makes an excellent framework for developing a comprehensive set of automatic diagnostic tasks.

5.3 IBM Netfinity Manager

IBM Netfinity Manager is IBM's comprehensive hardware systems management tool for your complex system installations in network or stand-alone environments. That includes your server as well as your workstations and non-IBM products. It provides an easy-to-use graphical set of local and remote services designed to make the server and client systems simple and affordable to manage.

Netfinity Manager is included with every IBM Netfinity and PC Server system and is shipped as part of the ServerGuide. One license of the manager code and 10 licenses of the Client Services are included.

From the SAP R/3 system point of view it is a system management platform that gives the system and network administrator a huge choice of tools designed to assist in the management and monitoring of your hardware environment both remotely and locally.

Netfinity Manager operates in a peer-to-peer mode that minimizes the need for expensive system management hardware. All that is required is the presence of a physical network or a serial link. Netfinity Manager has its own interprocess communication (IPC) system that is used for communication between Netfinity Manager modules and services, locally and when operating remotely over a network. Netfinity Manager collects all data about your systems that you request to monitor in real time and online. The data represent the current status of your systems and are not collected from old database information but can be exported to databases. Netfinity Manager has a very flexible, modular design that allows for a variety of system-specific installations and plug-in options to be used.

The IBM Netfinity Manager consist of two components:

- Netfinity Manager
- Client Services for Netfinity Manager (Client Services)

Wherever you want to manage some other PCs or server, you would use Netfinity Manager. Whichever machines you want to be manageable remotely or if you only want that machine to be able to manage itself and no other machines, you would install Client Services for Netfinity Manager.

5.3.1 The Netfinity Manager

Netfinity Manager is the managing portion of the system. This component would normally be installed on the administrator's workstation and/or the servers themselves.

Netfinity Manager is used for managing remote systems as well as the server or workstation it is installed on. As a result a Netfinity Manager installation includes the code for all Netfinity Manager functions and communications drivers to enable management of all other machines with Netfinity Manager installed. As well as

having all the base services locally, it can include the following extra functions if they are chosen at install time:

- Remote Workstation Control
- Service Processor Enhancement
- World Wide Web Enhancement
- Capacity Management

5.3.2 The Client Services for Netfinity

Client Services for Netfinity Manager is the *managed* portion of the system. This is a foundation that provides the underlying services for several levels of administration, including remote system and user management facilities.

This component will be the one installed on managed end-user workstations and/or on managed servers which itself are not able to manage other servers or workstations.

Client Services for Netfinity Manager can be configured in three client modes of operation:

- Stand-alone client

  Stand-alone mode allows individual uses, who are not connected to a network, to effectively manage or monitor their own systems, including hardware, resources and performance. Only those base services and matching user interfaces that work with the installed hardware and do not require a network connected machine are installed.

- Passive client

  The passive client cannot manage itself. Instead, Netfinity Manager on another machine in the network must be used to manage this workstation or server. This mode is most effective for network administrators who do not want individual users or server consoles to have management capability. Only the Alert Manager, serial control and Security Manager functions are available on this machine.

- Active client

  The active client can manage itself or it can be managed by other systems with Netfinity Manager installed. Like the other clients, only the services and network protocols required for this particular machine are installed. In comparison to the passive client mode, the active client mode allows local users to perform their own subset of local systems management tasks.

5.3.3 Supported Platforms

- Netfinity Manager runs on the following operating systems:
  - OS/2 Warp V3.0, or later
  - OS/2 Warp Server (including the SMP version)
  - Windows 95
  - Windows NT 3.51 or 4.0
- Client Services for Netfinity Manager runs on the following operating systems:
  - OS/2 Warp V3.0, or later
  - OS/2 Warp Server (including the SMP version)

  - Windows 95
  - Windows NT 3.51 or 4.0
  - NetWare 3.11, 3.12, 4.1 or 4.11
  - Windows 3.x
- Netfinity Manager is designed to work with the existing protocols on the network and includes support for:
  - NetBIOS
  - TCP/IP
  - IPX
  - Serial
  - SNA (LU. 6.2) (except on NetWare and Windows 3.x)

5.3.4 IBM Netfinity Manager 5.x Functional Enhancements

The following items are new in Version 5.0 of Netfinity Manager:

- Remote Workstation Control

  Remote workstation control gives the administrator the possibility to take over the remote system inclusive the graphical interface. Using this feature, the administrator can access the remote system's console, making every operation possible as though the operator were at the system itself. This function exists for the OS/2, Windows 95 and Windows NT manager.

- Mass Configuration

  Using the Service Configuration Manager, it is now possible to extract some of the Netfinity Manager services configurations. Once saved, the configuration can be replicated across multiple systems using the event scheduler.

- Command Line Interface

  Enables experienced users to perform intricate and powerful systems-management tasks using a command-line format.

  If you want to read more about the CLI, see redbook *Netfinity V5.0 Command Line and LMU Support,* SG24-4925.

- System Management Server (SMS) Integration

  System information gathered by Netfinity Manager can now be viewed from within SMS.

- SNA Support

  You can now communicate over the SNA protocol. Netfinity Manager 5.0 supports the following SNA stacks:

  - OS/2
    - IBM Communications Manager/2 Version 1.11
    - IBM Communications Server for OS/2 Warp V 4.0
    - Client Access/400 Optimized for OS/2
  - Windows 95
    - Personal Communications/3270 4.1 with CSD1 level (August 96)
  - Windows NT

- Microsoft SNA Server Version 2.11 with Service Pack 1 and WCPIC32.DLL dated 01/22/97 or later

- ODBC Support

  Netfinity Manager supports exporting data via ODBC for use on SQL or DB2 database systems. The Netfinity Manager Database Administrator is provided to create, delete and grant access on these databases tables.

  For more information on Netfinity's database support, see redbook *Netfinity V5.0 Database Support,* SG24-4808.

The following items are new in Version 5.1 of Netfinity:

- Capacity Management

  The Capacity Management function collects and saves statistics gathered by Netfinity Manager for each machine you select. The data can then be displayed graphically providing trend information over a period of time.

  Capacity reports can be scheduled monthly, weekly, daily or hourly and data can be exported for use in spreadsheets and the like.

- IBM Cluster Systems Management

  ICSM is a tool for managing Microsoft Cluster Server clusters. As well as providing the same functions as the built-in MSCS Administrator, ICSM offers enhancements in three categories:

  1. Ease of use -- the Cluster Expert Wizard lets administrators easily set up resource groups and manage virtual IP addresses.
  2. Productivity -- with the Scheduler, the administrator can set up load balancing capabilities by moving or forcing offline, specific resources.
  3. Events/Problem Notification -- using the alert functions of Netfinity, ICSM can generate alerts when certain cluster events occur, including changes in any resource and group states.

     The ServerGuide even contains versions of the ICSM on the Application Guide 3A CD-ROM which can be installed in the Intel LANDeskmanager and the Compaq Insight Manager.

- Advanced Systems Management Adapter Support

  Netfinity Manager has been enhanced to support the latest functions of the Advanced Systems Management Adapter.

5.3.5 Netfinity Manager Functions

The Netfinity Manager main window consists of a set of icons which constitute the graphical user interface component of Netfinity Manager and provide an interface to the base services. The base programs enable the individual functions to be accessed remotely by the Netfinity Manager, but do not allow for local access. The GUIs, when working in conjunction with their respective base program, enables the user to access the service. See 5.3.1, “The Netfinity Manager” on page 118 and 5.3.2, “The Client Services for Netfinity” on page 119 for further details.

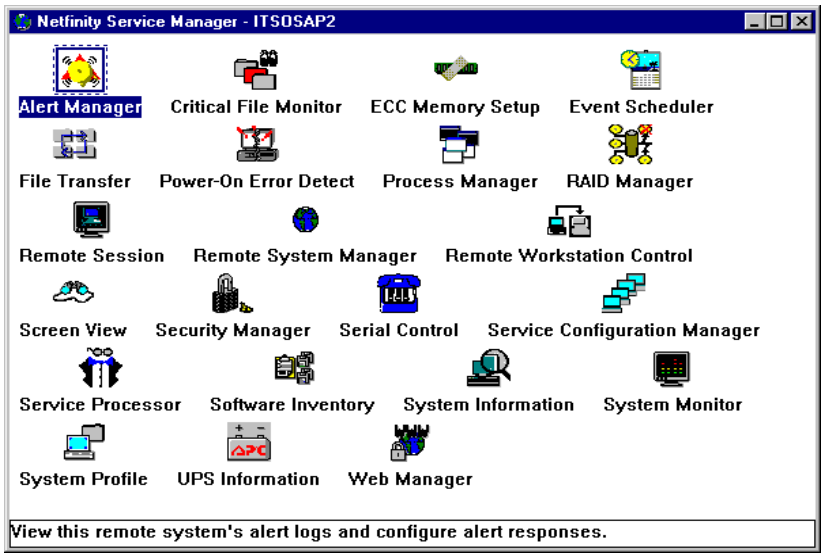


Figure 80. A Typical Netfinity Manager Main Menu

The following full list of functions that are available in a standard installation are briefly discussed below. Complete instructions on how to use each of these services can be found in the online help provided with the product and in the redbook *Netfinity Server Management,* SG24-5208.

- Alert Manager
- Capacity Management
- Critical File Monitor
- DMI Browser (requires DMI Service Layer)
- ECC Memory Setup (requires ECC memory)
- Event Scheduler
- File Transfer
- Power-On Error Detect
- Predictive Failure Analysis (requires PFA-enabled hard disk drives)
- Process Manager
- RAID Manager (requires a RAID subsystem)
- Remote Session
- Remote System Manager
- Remote Workstation Control
- Screen View
- Security Manager
- Serial Connection Control
- Service Configuration Manager
- Service Processor Manager
- System Diagnostics Manager
- Software Inventory
- System Information Tool
- System Monitor
- System Partition Access (for Micro Channel machines with built-in system partitions)
- System Profile
- Web Manager Configuration

All Services Installed?

The GUI program files for ECC configuration, System Partition Access, RAID administration, Predictive Failure Analysis and DMI Browser will be installed regardless of whether your system has the associated hardware features installed. This enables a network administrator to remotely access these services on other systems. But the icons in the Netfinity Manager main menu of these services are available only if the managed systems have certain system configurations.

The following manuals are also available:

- Netfinity Manager Quick Beginnings, part 30F6988
- Netfinity Manager User Guide, part 30F6984
- Netfinity Manager Command Reference, part 30F6989
- Netfinity Services Quick Beginnings, part 4306981
- Netfinity Services User Guide, part 30F6985

You may also find the following manuals on the ServerGuide on the Book Factory CD-ROM in PostScript format. The files are in the \PUBS\EN directory.

- OWMGREN.PS -- Netfinity Manager User's Guide
- OWSVCEN.PS -- Client Services for Netfinity Manager User's Guide
- COMREFEN.PS -- Netfinity Manager Command Reference
- NETSVCEN.PS -- Client Services for Netfinity Manager for NetWare User's Guide

On the Software Guide CD-ROM in the ServerGuide package you can also obtain these manuals in OS/2 Help File (INF) format. They are in the \PUBS\EN directory of that CD-ROM.

On the Application Guide CD 3A in the ServerGuide package, you can get all Netfinity Manager manuals in OS/2 Help File (INF) format and Acrobat Reader Format (PDF) as well. The *Netfinity Services Quick Beginnings* manual is in Hypertext markup language format (HTML). They are in the \Netfin\EN\DOCS\ directory of that CD-ROM. Additionally, there are two tools, XView.exe and IView.exe, to read the OS/2 Help File format in Windows NT or Windows 95.

5.3.5.1 Alert Manager

The Alert Manager is an extendable facility that allows receiving and processing of application-generated alerts. A predefined set of alert profiles is available to monitor the subsystems of the IBM Netfinity and PC Servers (for example RAID alerts, PFA alerts, ECC memory monitors).

A variety of actions can be taken in response to alerts, including logging alerts, notifying the user, forwarding the alert to another system, executing a program, playing a WAV file (available only on multimedia systems), generating an SNMP alert message, dialing out to a digital pager service (available only on systems that have a modem), or taking an application-defined action. Actions are user-definable, using a highly flexible action management interface.

An extensive, detailed log is kept of all alerts received by the Alert Manager. Logged information available from the log includes date and time the alert was

received, type and severity of the alert, the ID of the application that generated the alert, as well as any text that was generated and any action taken by the Alert Manager. Individual or multiple alerts can be selected from the log and printed for later reference, or deleted once problems are corrected. This service is available for both stand-alone and network use.

5.3.5.2 Capacity Management

Capacity Management enables you to collect monitored system data from multiple systems on your network, compile the data into reports, and view the data in a simple to read and understand line graph. You can use Capacity Management to:

- Generate reports
- Schedule reports to be generated automatically at a later time
- View previously generated reports

Capacity Management includes extensive online help, including online tours and interactive help pages that guide you through all of Capacity Management functions, making it especially simple to learn and understand this service.

Note: The Capacity Management interface is available for use only on systems running Windows NT. However, data can be collected from any remote systems running Client Services for Netfinity Manager for OS/2, Windows 95, Windows NT, or NetWare.

Note: Capacity Management is a new function of Netfinity Manager V5.1. To collect data from a remote system, that system must be running Netfinity Manager V5.1 or higher.

Refer to http://www.us.pc.ibm.com/server/capmgr/ for more information and an online demo of the Capacity Management function.

5.3.5.3 Critical File Monitor

Critical File Monitor enables you to be warned whenever critical system files on your system are deleted or altered. Critical File Monitor makes it simple for you to generate Netfinity Manager alerts when an important System File (such as the CONFIG.SYS file) changes date, time, size, or when it is deleted or created. There is a set of standard files that are monitored, and user-specified files can be added to the list.

5.3.5.4 DMI Browser

DMI Browser enables you to examine information about the DMI-compliant hardware and software products installed in or attached to your system.

The Desktop Management Interface (DMI) is an industry standard that simplifies management of hardware and software products attached to, or installed in, a computer system. The computer system can be a stand-alone desktop system, a node on a network, or a network server. DMI is designed to work across desktop operating systems, environments, hardware platforms, and architectures.

DMI provides a way to provide or obtain, in a standardized format, information about hardware and software products. Once this data is obtained, desktop and network software applications can use that data to manage those computer products. As DMI technology evolves, installation and management of products in

desktop computers will become easier, and desktop computers will become easier to manage in a network.

5.3.5.5 ECC Memory Setup

The ECC Memory Setup allows for monitoring of ECC memory single-bit errors, and can automatically *scrub,* or correct, the ECC memory when errors are detected. Also, you can keep a running count of single-bit errors, and can set a single-bit error threshold that will cause a non-maskable interrupt (NMI) if the ECC single-bit error threshold is exceeded.

This service is available for both stand-alone and network use by any system that has ECC memory.

5.3.5.6 Event Scheduler

You can use Event Scheduler to automate many Netfinity Manager services. With Event Scheduler, you can automatically gather and export System Information Tool, System Profile, and Software Inventory data, distribute or delete files, restart systems, execute commands, and access and manage system partitions on all of the Netfinity Manager systems on your network. Scheduled events can be performed one time only, or can be performed according to a user-defined schedule.

A new feature in Netfinity Manager 5.01 or higher is the ability to perform a scheduled RAID Data Scrubbing (also know as synchronization). The Event Scheduler is treated as a remote service in Netfinity Manager so requires a valid incoming user ID and password.

5.3.5.7 File Transfer

You can use the File Transfer service to easily send to, receive from, or delete files or directories on remote Netfinity Manager systems in your network.

5.3.5.8 Power-On Error Detect

The Power-On Error Detect service is only available on Micro Channel machines. It will install a shriek system on the system partition, which will broadcast any POST alert. This alert will be received by all Netfinity Managers.

5.3.5.9 Predictive Failure Analysis

The Predictive Failure Analysis (PFA) service enables you to continually monitor and manage PFA-enabled hard disk drives. A PFA-enabled hard disk drive features hardware designed to help detect drive problems and predict drive failures before they occur, thus enabling you to avoid data loss and system downtime.

In addition to the PFA hard disk drives, Netfinity Manager for OS/2 and Windows NT both support hard disk drives that conform to the self-monitoring analysis and reporting technology (SMART) standard. SMART stands for self-monitoring analysis and reporting technology and is the successor to the PFA technology that was pioneered by IBM. The PFA technology subsequently became the

ANSI-standard SMART SCSI protocol and lead to the setting up of the SMART working Group (SWG). The SMART standard has now been extended to IDE/ATA drives.

Netfinity Manager and Client Services for Netfinity Manager for OS/2 or Windows NT support PFA-enabled hard disk drives that conform to the SMART standard.

Note: Support for SMART hard disk drives is available only on systems running Netfinity Manager or Client Services for Netfinity Manager for OS/2 or Windows NT.

All disks in the current server range are either PFA or SMART enabled.

5.3.5.10 Process Manager

You can use Process Manager to view detailed information about all processes that are currently active on any system. You can also stop or start processes and generate Netfinity Manager alerts if a process starts, stops, or fails to start within a specified amount of time after system startup.

5.3.5.11 RAID Manager

The RAID Manager service enables you to monitor, manage, and configure an assortment of Redundant Arrays of Independent Disk (RAID) adapters and arrays without requiring you to take the RAID system offline to perform maintenance. Use the RAID Manager to gather data about your system's RAID array and RAID adapter, rebuild failing drives, add (or remove) logical drives, perform data integrity tests, and many other RAID system tasks. This service is available for both stand-alone and network use by any system that has a supported RAID adapter.

All IBM RAID adapters are supported by the Netfinity Manager.

5.3.5.12 Remote Session

You can use Remote Session to establish a text-based command-line session with any remote Netfinity Manager system.

5.3.5.13 Remote System Manager

As system administrator, this will probably be the function you'll use the most. You can use Remote System Manager to access and manage any Netfinity Manager function on any Netfinity Manager system in your network.

Netfinity Remote System Manager organizes all Netfinity Manager remote systems into groups. Three types of groups are available for your use: system groups, rack groups, and cluster groups.

1. A *system group* is a group of individual, network-attached systems that can be accessed, managed, and monitored by the Remote System Manager.
2. A *rack group* is a group of systems that are installed in an IBM Netfinity Rack. Rack-mounted systems can be configured to include a rack configuration file. This file contains information regarding the name of the rack, location of the system within the rack, name of the rack collection suite that the rack is part of, and so forth.

Otherwise, systems included in a rack group behave exactly like systems included in a system group. You can use the Netfinity Rack Configurator to define a configuration for a rack, then save it to be imported into Netfinity Manager. The Rack Configurator software is contained in the ServerGuide on the Application Guide CD-ROM 3A or the latest version on the World Wide Web at

http://www.pc.ibm.com/us/products/netfinity/download.html

in the *Configurator Tools* section.

3. A *cluster group* is special type of system group intended for managing multiple servers which work together. By entering the cluster name, the servers in that cluster will appear in this group.

This feature is available in Netfinity Manager 5.1 or higher.

Adding Members to Groups

There are three ways to add members to a group:

1. One-off auto-discovery
2. Auto-discovery at a regular interval
3. Manual entry

Netfinity Manager has the ability to discover LAN-attached client workstations automatically. For example, if a new machine with Client Services or Netfinity Manager appears on the LAN, the next time a broadcast is made from the group within Netfinity Manager, the new LAN-attached machine will respond and a new icon will appear in that group.

The time between auto-discovers is defined when the group is created and can be edited along with keywords and the group name. By default, it is disabled, but the discovery interval can be set from 1 to 164 hours.

If you do not want Netfinity Manager to auto-discover at regular intervals, you can either select a one-off auto-discover or add a machine manually.

TCP/IP Auto-Discover

If you are using the TCP/IP protocol driver, Remote System Manager will discover remote Netfinity Manager systems using TCP/IP only on your local TCP/IP subnet. If you also want to access Netfinity Manager systems in other TCP/IP subnets, you can either add them manually or you can create a text file named TCPADDR.DSC in your Netfinity Manager directory (C:\NETFIN by default).

Auto-Discover Keywords

Netfinity Manager uses keywords to determine if a remote Netfinity Manager system should be included in a group. When you first installed Netfinity Manager or Client Services, you specified a group of user-defined keywords (you can change these keywords later by running the Network Driver Configuration program). These user-defined keywords might include physical location information or departmental information.

When you define a group, you specify what keywords should be present in each machine for it to be included in the group. You can specify either user-defined keywords, or, with Netfinity Manager Version 5.0 or later, system-defined keywords. Some examples for predefined keywords are used operating system, used network protocol or available Netfinity Manager services.

System-defined keywords are automatically assigned to a remote system, if they have certain hardware or software characteristics. These allow an administrator to group machines of similar configuration. For information on application keywords and a entire list of system-defined keywords, see "Using Application Keywords" in Chapter 22 of the Netfinity Manager User's Guide.

5.3.5.14 Remote Workstation Control

Remote Workstation Control

This feature in Netfinity Manager 5.0 or higher enables you to monitor or control the screen display of a remote Netfinity Manager system. Once you initiate a Remote Workstation Control (RWC) session with another Netfinity Manager system, you can passively monitor events that are occurring on the display of the remote system or actively control the remote system's desktop.

When you initiate an active RWC session, all mouse clicks and keystrokes entered on your system are automatically passed through to the remote system except for specific keystrokes like Ctrl-Esc or Ctrl-Alt-Del, which can be issued remotely through menu action. With RWC, you can remotely start programs, open and close windows, enter commands, and much more.

The RWC function is comparable to the OS/2 DCAF product. It has the same functions, except for file transfer. This function is available through the Netfinity Manager File Transfer service.

Although the RWC function is capable of taking over a system's console, you must take into account that all the actions taken have to be transferred over the network. This means that there is a difference in responsiveness when working remotely, compared to working at the system itself. This performance difference is accentuated when using slow data links, like serial connections through a modem. We recommend you use at least a 14.4 Kbps modem.

Note: The use of Remote Workstation Control is *not* officially supported through a modem.

5.3.5.15 Screen View

Screen View

The Screen View service takes a "snapshot" of any remote Netfinity system's graphic display and displays it on your screen. This method, although not interactive, is faster than using Remote Workstation Control, if you only want to see the screen of the remote machine. It also has less impact on the remote workstation and creates less network overhead. These snapshots can then be saved as bitmaps and viewed later.

5.3.5.16 Security Manager

Security Manager

The Security Manager can prevent unauthorized access to some or all of your Netfinity Manager services. It uses incoming user ID and password combinations, and only allows authorized remote users to access the specified Netfinity Manager functions.

The Security Manager only applies to network use. It does not prevent unauthorized users from accessing Netfinity Manager functions while they are working locally. You should implement other local security measures to prevent this.

Warning: Security Not Enabled

After installation, one user ID will be defined in the security manager, with all accesses granted. Since this user ID is the <PUBLIC> user ID, it means that everyone has access to your system.

The first step after installation should be to open the Security Manager, and revoke all disallowed actions to <PUBLIC>. Don't forget to uncheck the box that authorizes security manager access. If this is box remains checked, <PUBLIC> will still have the ability to change the security access, regardless of whether or not they have that access now.

5.3.5.17 Serial Connection Control

The Serial Connection Control service enables remote Netfinity Manager managers to access your local Netfinity Manager over a serial port through a phone line and modem or a null modem connection. With the Serial Connection Control service, you don *not* have to be attached to a network to benefit from Netfinity's outstanding remote system access, monitoring, and management capabilities.

Your system must have a properly installed and configured modem that supports at least 9600 baud for the Serial Connection Control service to function.

5.3.5.18 Service Configuration Manager

This new function enables you to save the configuration of a Netfinity service from a selected system to a service configuration file (SCF). Once created, SCF files can be used by Event Scheduler to restore the configuration back to the same system, or it can be used (in conjunction with the Event Scheduler) to propagate that configuration on whatever other similar systems you choose.

An example can be the System Monitor Function. If you define thresholds and alerts on one system, you can save these in a file using the Service Configuration Manager. Later, you can distribute this file to other systems, which then will use these settings for their own system monitor.

You can create SCF files for the following functions:

- Alert Manager
- Critical File Monitor
- System Monitor
- Process Manager
- Security Manager

5.3.5.19 Service Processor Manager

The Service Processor Manager enables communication between Netfinity Manager and the Advanced Systems Management Adapter card. It can be used to configure and monitor many features of your system's ASMA card. With Service Processor Manager you can configure ASMA card events (such as POST, loader, and O/S time outs; critical temperature, voltage, and tamper alerts; power supply and fan failures). This service also enables you to dial-out and

directly access and control a remote system's ASMA card over the Serial Connection Control service.

In addition, Service Processor Manager enables you to remotely monitor, record, and replay all textual data generated by a remote system during POST. While monitoring a remote system during POST, you can enter key commands on your keyboard which will then be relayed to the remote system.

5.3.5.20 System Diagnostics Manager

The System Diagnostics Manager lets you initiate a variety of diagnostic tasks on systems that support ROM based diagnostics. The results of all previously run diagnostic sessions are stored on the system and can be examined using System Diagnostics Manager to help diagnose and resolve system problems. The System Diagnostics Manager can run diagnostics on any of the following system components:

- System Board
- Memory
- Keyboard
- Video
- Diskette
- Alternate (second) CPU
- Parallel
- Serial
- Ethernet
- SCSI
- RAID
- Mouse

Currently, the only systems supporting this feature are the following:

- IBM PC Server 325 (Pentium II models)
- IBM PC Server 330 (Pentium II models and the 8640-PM0 model)

5.3.5.21 Software Inventory

Enables you to make an inventory of software products installed on the system. You can also manage software product dictionaries, to define products that are not in the default dictionary. You can define these products based on the SYSLEVEL, or on a file name.

5.3.5.22 System Information Tool

The System Information Tool enables you to quickly and conveniently access detailed information on the hardware and software configurations of your system. System Information Tool gathers information about almost any computer; however, the most detail is provided when this service is used with IBM computers. This service is available for both stand-alone and network use.

5.3.5.23 System Monitor

The System Monitor provides a convenient method of charting and monitoring the activity of a number of components in a system, including processor usage, disk space used, and ECC memory errors. These convenient monitors are detachable and scalable, enabling you to keep only the monitors you need available at all times. You can use System Monitor's Threshold Manager to set threshold levels

for any of the monitored components. When exceeded, these thresholds will generate user-configured alerts.

Data is continually collected from the time the system starts. A sophisticated data-handling technique is used to weigh the individual values, average concurrent samples, and post single values that accurately reflect long-term system activity. This technique allows you to maintain system activity records without creating enormous data files. This service is available for both stand-alone and network use.

In Netfinity Manager, extra monitors are included to monitor operating system or hardware specific features.

For example the following extra monitors are available:

- NDIS packets transmitted
- NDIS bytes transmitted
- NDIS packets received
- NDIS packets transmitted
- Ring utilization
- Every server with ASMA card temperatures and voltages
- IBM Netfinity 7000 temperatures and voltages with standard ASMA card
- IBM Netfinity 7000 temperatures and voltages over on-board INCA management chip
- PC Server 720 temperatures and voltages over particular on-board management chip and sensors

The open architecture of Netfinity Manager, also allows other manufacturers to include their own specific monitors. Examples of these are UPS systems from APC, where voltage monitors are available. Another examples are Lotus Domino monitors.

System Partition Access

5.3.5.24 System Partition Access

The System Partition Access is only available on Micro Channel systems which have a system partition. It allows you to back up and restore system partitions, and to manage files located on the system partition (diagnostic files and adapter definition files).

System Profile

5.3.5.25 System Profile

The System Profile service enables you to record system specific information that is not directly related to the hardware or software. It provides a convenient notebook of pertinent data about a particular user or system. It features many predefined fields for extensive user-specific data, including name, address, office number and location, and phone number. System Profile also includes many predefined fields for system-specific data that might not be available to System Information Tool, including model and serial numbers and date of purchase.

Finally, there are many user-definable "miscellaneous" fields that can be used to hold any data the user or administrator requires.

Web Manager

5.3.5.26 Web Manager Configuration

Netfinity Manager can be accessed through the Internet or an Intranet via a Netfinity Manager with the Web Manager enabled. Once enabled, you can use any Web browser to perform a subset of the Netfinity Manager functions.

You can use the Web Manager Configuration service to limit access to the to specific TCP/IP addresses or ranges of addresses.

When enabled, all authorized systems running a Web browser, can access a subset of the Netfinity Manager manager functions. This enables you to do remote system management over the Internet, *without* having to install Netfinity Manager.

Note: The Remote Workstation Control and any of the RAID actions are not accessible from the browser. You can view the RAID configuration, but you cannot perform any actions on the RAID arrays such as RAID synchronization, stop and restart drive functions. The synchronization through the Event Scheduler is available.

Appendix A. Hardware and SAP R/3 Configurations Used for This Book

We worked with the following hardware setups and SAP R/3 configurations for this book.

1. Centralized Installation
    - IBM Netfinity 7000 Model 8650-RM0
    - 768 MB of main memory
    - Four Pentium Pro 200 MHz 512KB 2nd Level Cache processors
    - IBM ServeRAID II adapter with the 8 MB Battery-Backup Cache Option
    - 6x4.51 GB IBM Hard Disk Drives in the Netfinity 7000
    - 6x4.51 GB IBM Hard Disk Drives in the IBM Netfinity EXP10 Storage Expansion Unit
    - IBM Etherjet 100/10 Fast Ethernet Adapter
2. Distributed Installation
    - Database Server and Central Instance
        - IBM Netfinity 7000 Model 8650-RM0
        - 768 MB of main memory
        - Four Pentium Pro 200 MHz 512KB 2nd Level Cache processors
        - IBM ServeRAID II adapter with the 8 MB Battery-Backup Cache Option
        - 6x4.51 GB IBM Hard Disk Drives internal
        - 6x4.51 GB IBM Hard Disk Drives in the IBM Netfinity EXP10 Storage Expansion Unit
        - IBM Etherjet 100/10 Fast Ethernet Adapter
    - Application Server
        - IBM Netfinity 7000 Model 8650-RM0
        - 256 MB of main memory
        - Two Pentium Pro 200 MHz 512KB 2nd Level Cache processors
        - IBM ServeRAID II adapter with the 8 MB Battery-Backup Cache Option
        - 2x4.51 GB IBM Hard Disk Drives internal
        - IBM Etherjet 100/10 Fast Ethernet Adapter
    - Application Server
        - IBM PC Server 325 Model 8639-RB0
        - 320 MB of main memory
        - Pentium II 266 MHz 512KB 2nd Level Cache processor
        - On-Board Fast/Wide Ultra SCSI Controller used
        - 1x4.51 GB IBM Hard Disk Drives internal
        - On-Board Fast Ethernet Adapter
    - Domain Controller
        - IBM PC Server 325 Model 8639-RB0
        - 64 MB of main memory
        - Pentium II 266 MHz 512KB 2nd Level Cache processor
        - On-Board Fast/Wide Ultra SCSI Controller used
        - 1x4.51 GB IBM Hard Disk Drives internal
        - On-Board Fast Ethernet Adapter

We used the following RAID configuration for SAP R/3 centralized installation and later for the SAP R/3 Database Server with Central Instance.

© Copyright IBM Corp. 1998

IBM ServeRAID Adapter connections

- Channel 1 -- connected to IBM Netfinity 7000 Backplane with six internal 4.51 GB Hard Disk Drives
- Channel 2 -- connected to IBM Netfinity EXP10 Storage Expansion Unit SCSI Bus 1 with 3 4.51 GB Hard Disk Drives
- Channel 3 -- connected to IBM Netfinity EXP10 Storage Expansion Unit SCSI Bus 2 with 3 4.51 GB Hard Disk Drives

Table 10 shows the configuration of ServeRAID arrays, logical drives and operating system partitions.

Table 10. ServeRAID Arrays, Logical Drives and Operating System Partitions

ServeRAID Channel	Array	Logical Drives	Partition
1	A - 2x4.51 GB	#0 RAID-1 netto 4000 MB internal #1 RAID-1 netto 302 MB internal	C:\ - Primary NTFS partition D:\ - Primary NTFS partition
1	B - 2x4.51 GB	#2 RAID-1 netto 4303 MB	E:\ - Primary NTFS partition
1	C - 2x4.51 GB	#3 RAID-1 netto 4303 MB internal	F:\ - Primary NTFS partition
2 and 3	D - 6x4.51 GB	#4 RAID-5 netto 21515 MB external	G:\ - Primary NTFS partition
CD-ROM Drive			Z:\

Table 11 shows the disk distribution of the operating system and SAP R/3 installation.

Table 11. SAP R/3 Disk Distribution

Directory	Contents
C:\	Windows NT 4.0 and page file
D:\	Second Windows NT 4.0 and page file
F:\USR\SAP	SAP R/3 directory (EXE and configuration Files)
F:\ORANT	Installation and upgrade directory for the database software
E:\ORACLE\RDU	Directory for our Oracle instance - RDU
E:\ORACLE\RDU\origlogA	Online redo logs set A
E:\ORACLE\RDU\origlogB	Online redo logs set B
-:\ORACLE\RDU\mirrlogA	Mirrored online redo logs set A (not created, because hardware mirroring)
-:\ORACLE\RDU\mirrlogB	Mirrored online redo logs set B (not created, because hardware mirroring)
F:\ORACLE\RDU\saparch	Backup of online redo logs
F:\ORACLE\RDU\sapreorg	Working directory for database administration
F:\ORACLE\RDU\saptrace	Oracle alert and trace files
F:\ORACLE\RDU\sapbackup	BRBackup logs and BRBackup default directory for backups to hard disk
F:\ORACLE\RDU\sapcheck	Logs of sapdba
G:\ORACLE\RDU\sapdata1	SAP database
G:\ORACLE\RDU\sapdata2	SAP database
G:\ORACLE\RDU\sapdata3	SAP database
G:\ORACLE\RDU\sapdata4	SAP database
G:\ORACLE\RDU\sapdata5	SAP database
G:\ORACLE\RDU\sapdata6	SAP database

Appendix B. Certified IBM Netfinity Server Configurations

To run SAP R/3 on Windows NT and Intel-based server platforms, all hardware vendors require a certification by SAP to ensure an appropriate performance and compatibility.

This certification is done exclusively through the SAP contractor iXOS Software AG in Munich, Germany.

The decisive *critical components* to certify a server system for R/3 are processor generation, mainboard, main I/O controller. A change of these *critical components* requires usually a new certification. But it is a guideline that changes require a new certification, as changes such as new releases of already existing hardware are normally improvements, which means an already existing certification does not automatically expire due to such changes.

Two types of tests are run in this certification process: an extensive *stress test* to check the stability of the platform with a high R/3 load and detailed *benchmarks* to obtain performance results. The benchmark environment reflects a productive and real customer situation.

The results are documented in the R/3NTC certification report. The iXOS SAP R/3 NT certification status can be found on the World Wide Web at http://www.r3onnt.com/.

The following current IBM Intel-based server configurations have been SAP certified. The systems has been certified for SAP R/3 on Windows NT Server for all R/3 versions and releases and all available databases for R/3 such as DB2, SQL Server, Informix, Oracle, and Adabase.

- *IBM Netfinity 7000* with the *IBM SSA Cluster Adapter* is certified for Windows NT 4.0.
- *Netfinity 7000* with the *IBM SSA RAID Adaper* is certified for Windows NT 4.0 and as Windows NT 4.0 Application server for DB2 on an IBM S/390.
- *Netfinity 7000* with the *Symbios Logic*, PCI Ultra Differential SCSI controller SYM8751D and the Symbios MetaStor DS/RM-20E disk subsystem is certified for Windows NT 4.0.
- *Netfinity 7000* with *IBM ServeRAID II Adapter* is certified for Windows NT 4.0 and as Windows NT 4.0 Application server for DB2 on an IBM S/390.
- *IBM PC Server 704* with the *IBM SSA Cluster Adapter* is certified for Windows NT 4.0.
- *IBM PC Server 704* with the *IBM SSA RAID Adaper* is certified for Windows NT 4.0 and as Windows NT 4.0 Application server for DB2 on an IBM S/390.
- *IBM PC Server 704* with the *Symbios Logic*, PCI Ultra Differential SCSI controller SYM8751D and the Symbios MetaStor DS/RM-20E disk subsystem is certified for Windows NT 4.0.
- *IBM PC Server 704* with the *Mylex PCI RAID Controller DAC 960P* is certified for Windows NT 3.51, Windows 4.0 and as Windows NT 4.0 Application server for DB2 on an IBM S/390.

© Copyright IBM Corp. 1998

- *IBM PC Server 704* with the *IBM PC ServeRAID Adapter* is certified for Windows NT 4.0 and as Windows NT 4.0 Application Server for DB2 on an IBM S/390.
- *IBM PC Server 330* Pentium II model with the *IBM ServeRAID II Adapter* is certified for Windows NT 4.0.
- *IBM PC Server 330* Pentium Pro model with the *IBM PC ServeRAID Adapter* is certified for NT 4.0 and as Windows NT 4.0 Application server for DB2 on an IBM S/390.
- *IBM PC Server 325* Pentium II model with the *IBM ServeRAID II Adapter* is certified for Windows NT 4.0.

Appendix C. IBM Netfinity for Ready-to-Run R/3

Ready-to-Run R/3 is a new concept initiated by the SAP AG Walldorf, Germany.

R/3 is considered by many as difficult to implement and to install. This could hinder SAP as they want to increase market share particularly in the small and midrange business areas. Today, implementation time and project costs are additional issues.

Ready-to-Run R/3 is a strategic SAP initiative and designed to solve these problems. Ready-to-Run R/3 is an R/3 system solution that packages a pre-installed, pre-configured R/3 system with a complete hardware and software infrastructure. All that you have to do is unpack the Ready-to Run R/3 hardware, connect it, and start working with SAP R/3. Pre-sized, pre-installed, and pre-configured, Ready-to-Run R/3 simplifies the technical planning that goes along with introducing the powerful R/3 system.

Ready-to-Run R/3 means:

- Faster and cheaper implementation of R/3
- High system availibility through use of proven "best practices" in the Ready-to-Run R/3 design and implementation concept
- Reduced cost of ownership through streamlined, tool-supported administration

SAP is using the German market as a pilot market for the Ready-to-Run R/3 project. IBM together with SAP offers the Ready-to-Run R/3 IBM Netfinity 7000 offering based on IBM products -Netfinity, PC Server, desktops, network, software, support and service.

C.1 Implementation Phases

The IBM Netfinity for SAP R/3 NT RRR solution is planned to be implemented in three different phases:

- **Phase I** - Pilot RRR implementation in Germany. Pre-load and pre-configuration performed by CompuNet (implemented).
- **Phase II** - Availability of RRR for other countries. Pre-load and pre-configuration possible for a limited number of additional IBM business partners (availability planned for 2Q/98)
- **Phase III** - Worldwide availability (planned for 2H/98).

C.2 Ease of implementation

Project implementation costs and complexity are major issues for businesses adopting enterprise applications such as R/3. RRR systems make extensive use of SAP and IBM's proven R/3 implementation methodologies for fast and trouble-free rollouts. The Netfinity servers are available in RRR configurations, making them a highly cost-effective and attractive solution for businesses needing a rapid, economical implementation.

© Copyright IBM Corp. 1998

Appendix D. SAP R/3 Sizing and Installation Planning

IBM offers a facility to existing SAP customers on sizing of Netfinity Servers, according to their environment. This facility is offered through Internet. To make use of this facility and get help on Netfinity sizing, you need to go through *Quick Sizer*. Quick Sizer is a online sizing tool available from SAP that help customers perform quick sizing for their environment. This chapter covers in detail how to access *Quick Sizer* and how to submit a request to IBM for Netfinity Servers sizing.

The Quicksizer calculates hardware requirements (CPU, disk and memory resource) based on the number of users working with the different components of the R/3 system in a hardware and database independent format. The tool intends to give customers an idea about the size of the system necessary to run the required workload and therefore input for initial budget planning.

User-based sizing is only possible and practical up to a certain limit and heavily depends on many factors for example, the following:

- R/3 Version
- Database Version
- OS Version
- Hardware
- Number of users
- Amount of Reporting/Batch
- Load Profile

This tool delivers a hardware and database independent output in categories and classes measured in SAPS (SAP Application Benchmark Performance Standard).

D.1 How to Access the Quick Sizer Tool

To access the Quick Sizer Tool, use the following steps:

1. Start your Web browser.
2. Go to the Web Site at http://sapnet.sap-ag.de.
3. It will prompt you to enter your OSS user ID and password, which customers can get from SAP. After that you will see a screen as shown in Figure 81.

© Copyright IBM Corp. 1998

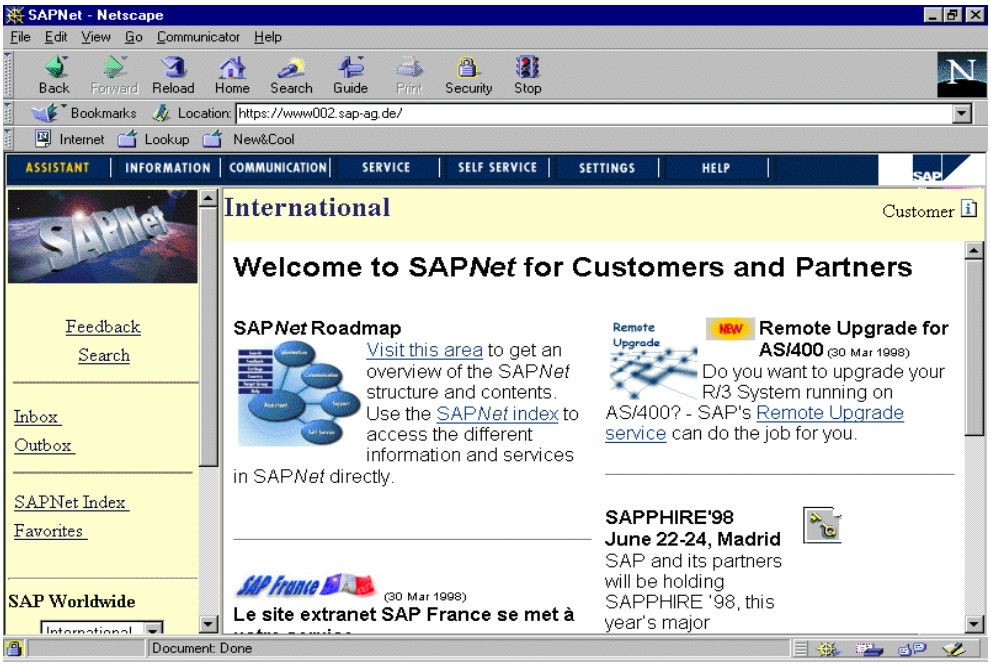

SAPNet - Netscape
File Edit View Go Communicator Help
Back Forward Reload Home Search Guide Print Security Stop
Bookmarks Location: https://www002.sap-ag.de/
Internet Lookup New&Cool
ASSISTANT INFORMATION COMMUNICATION SERVICE SELF SERVICE SETTINGS HELP
International
Customer
Welcome to SAPNet for Customers and Partners
Feedback
Search
Inbox
Outbox
SAPNet Index
Favorites
SAP Worldwide
SAPNet Roadmap
Visit this area to get an overview of the SAPNet structure and contents. Use the SAPNet index to access the different information and services in SAPNet directly.
Remote Upgrade for AS/400 (30 Mar 1998)
Do you want to upgrade your R/3 System running on AS/400? - SAP's Remote Upgrade service can do the job for you.
SAPPHIRE'98 June 22-24, Madrid
SAP and its partners will be holding SAPPHIRE '98, this year's major
(30 Mar 1998)
Le site extranet SAP France se met à
Document: Done

Figure 81. Welcome to SAPNet

4. Click on **SELF SERVICE** in the top bar and you will get to the screen for Services. On the left hand side, click **Quick Sizing** as shown in Figure 82.

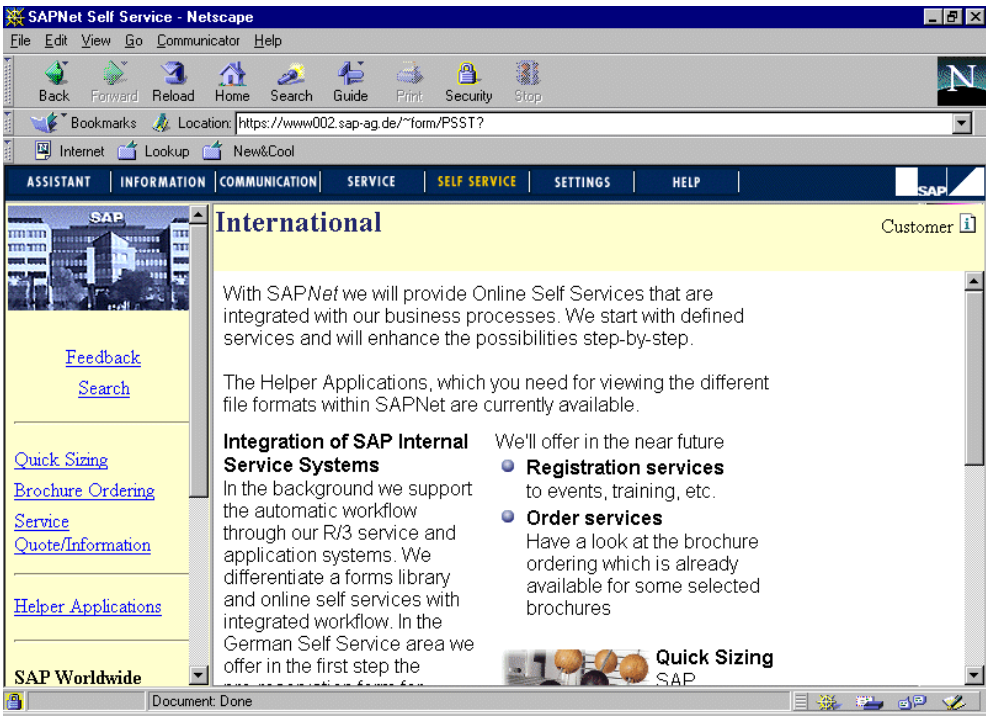

SAPNet Self Service - Netscape
File Edit View Go Communicator Help
Back Forward Reload Home Search Guide Print Security Stop
Bookmarks Location: https://www002.sap-ag.de/~form/PSST?
Internet Lookup New&Cool
ASSISTANT INFORMATION COMMUNICATION SERVICE SELF SERVICE SETTINGS HELP
International
Customer
With SAPNet we will provide Online Self Services that are integrated with our business processes. We start with defined services and will enhance the possibilities step-by-step.
The Helper Applications, which you need for viewing the different file formats within SAPNet are currently available.
Feedback
Search
Quick Sizing
Brochure Ordering
Service Quote/Information
Helper Applications
SAP Worldwide
Integration of SAP Internal Service Systems
In the background we support the automatic workflow through our R/3 service and application systems. We differentiate a forms library and online self services with integrated workflow. In the German Self Service area we offer in the first step the
We'll offer in the near future
Registration services
to events, training, etc.
Order services
Have a look at the brochure ordering which is already available for some selected brochures
Quick Sizing
SAP
Document: Done

Figure 82. SAPNet Self Services

5. The screen shown in Figure 83 gives a brief description of Quick Sizing. On the left hand side, click **Start Quick Sizing**.

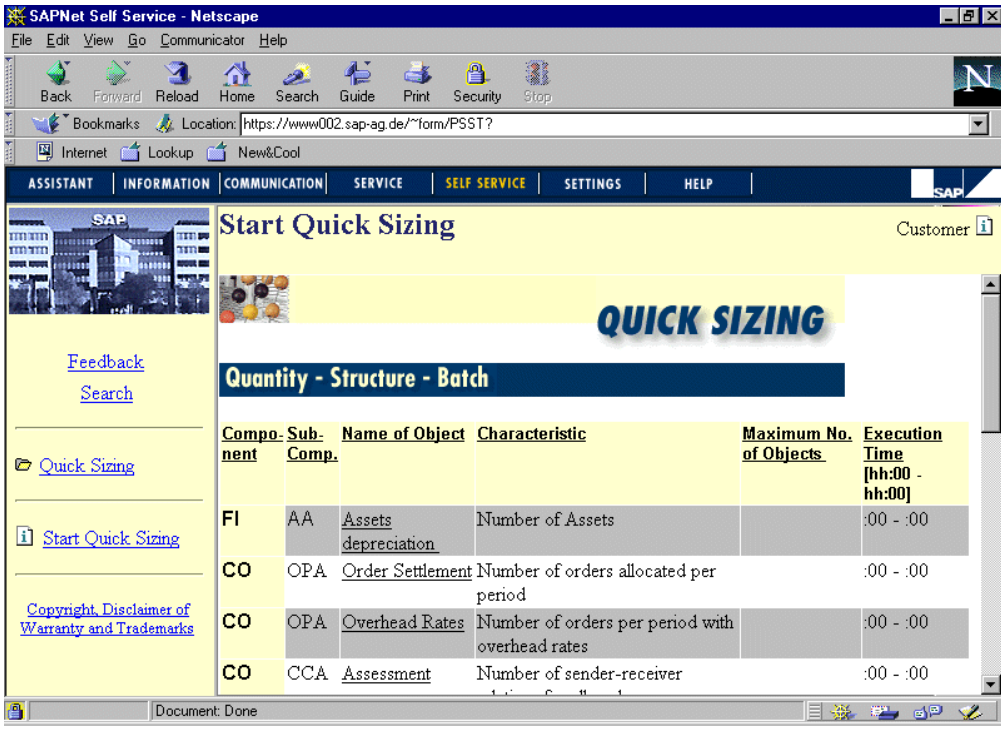

SAPNet Self Service - Netscape
File Edit View Go Communicator Help
Back Forward Reload Home Search Guide Print Security Stop
Bookmarks Location: https://www002.sap-ag.de/~form/PSST?
Internet Lookup New&Cool
ASSISTANT INFORMATION COMMUNICATION SERVICE SELF SERVICE SETTINGS HELP
SAP
Feedback
Search
Quick Sizing
Start Quick Sizing
Copyright, Disclaimer of Warranty and Trademarks
Start Quick Sizing
Customer
QUICK SIZING
Quantity - Structure - Batch
Compo-nent
Sub-Comp.
Name of Object
Characteristic
Maximum No. of Objects
Execution Time [hh:00 - hh:00]
FI AA Assets depreciation Number of Assets :00 - :00
CO OPA Order Settlement Number of orders allocated per period :00 - :00
CO OPA Overhead Rates Number of orders per period with overhead rates :00 - :00
CO CCA Assessment Number of sender-receiver :00 - :00
Document: Done

Figure 83. Quick Sizing

6. In the screen shown in Figure 84, enter your customer number and projectname, and then select the option given at the bottom of page **I agree**.

Some sample screens of Quick Sizer are shown in Figure 85, Figure 86, Figure 87, and the final result is shown in Figure 88. You may select the vendor, for example, IBM, in our case. It takes you to IBM SAP Alliance Web Sizing Request page, where you may select the platform (as shown in Figure 89), or you may visit IBM's Choosing Technology for R/3 Section.

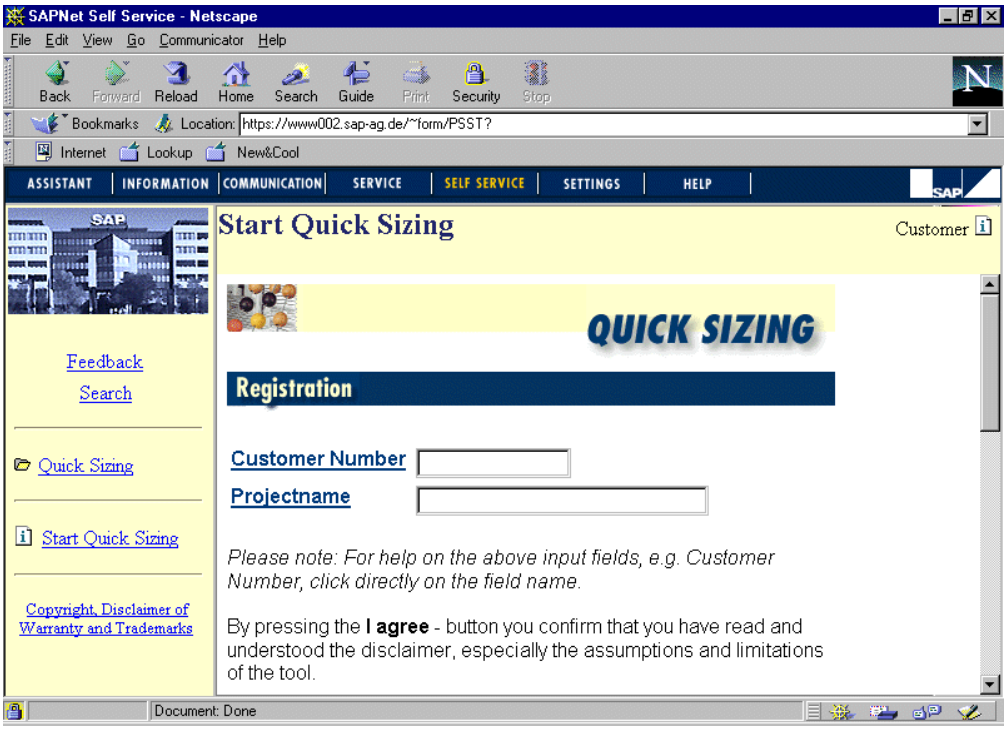

SAPNet Self Service - Netscape
File Edit View Go Communicator Help
Back Forward Reload Home Search Guide Print Security Stop
Bookmarks Location: https://www002.sap-ag.de/~form/PSST?
Internet Lookup New&Cool
ASSISTANT INFORMATION COMMUNICATION SERVICE SELF SERVICE SETTINGS HELP
SAP
Start Quick Sizing
Customer
QUICK SIZING
Registration
Customer Number
Projectname
Please note: For help on the above input fields, e.g. Customer Number, click directly on the field name.
By pressing the I agree - button you confirm that you have read and understood the disclaimer, especially the assumptions and limitations of the tool.
Feedback
Search
Quick Sizing
Start Quick Sizing
Copyright, Disclaimer of Warranty and Trademarks
Document: Done

Figure 84. Start Quick Sizing (Registration)

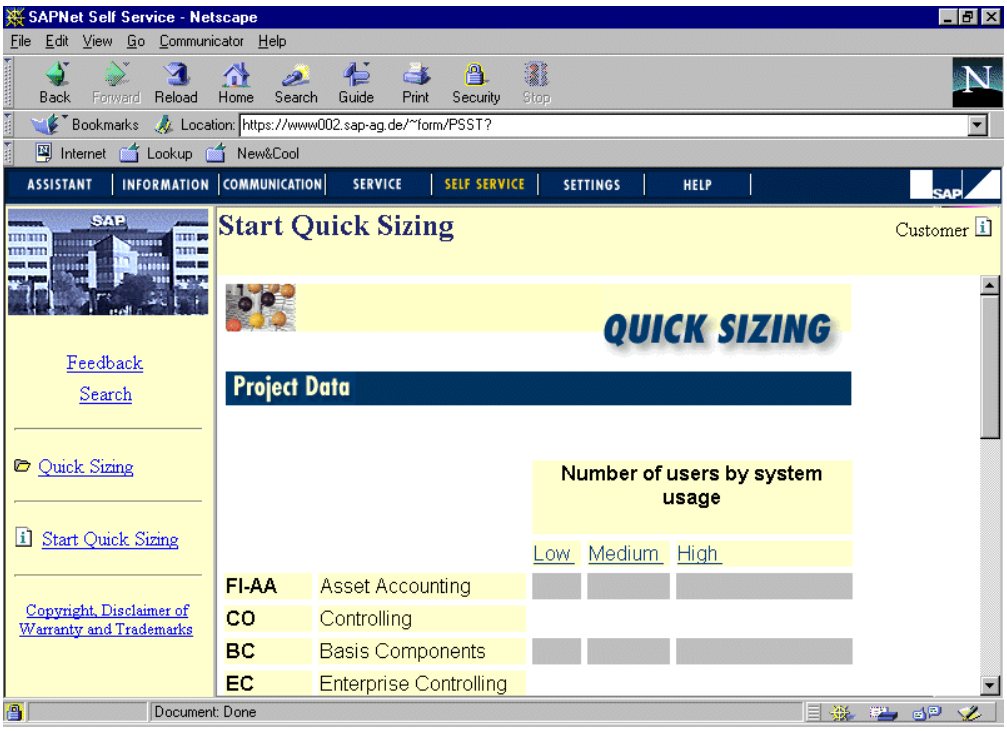


Figure 85. Start Quick Sizing (Project Data)

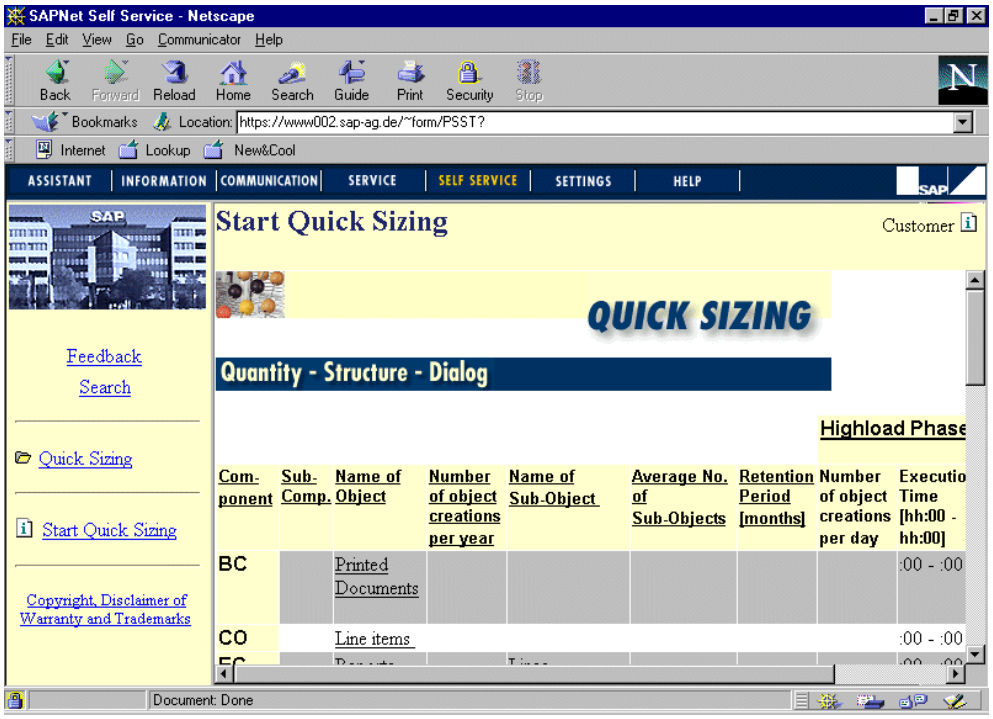


Figure 86. Start Quick Sizing (Quantity-Structure-Dialog)

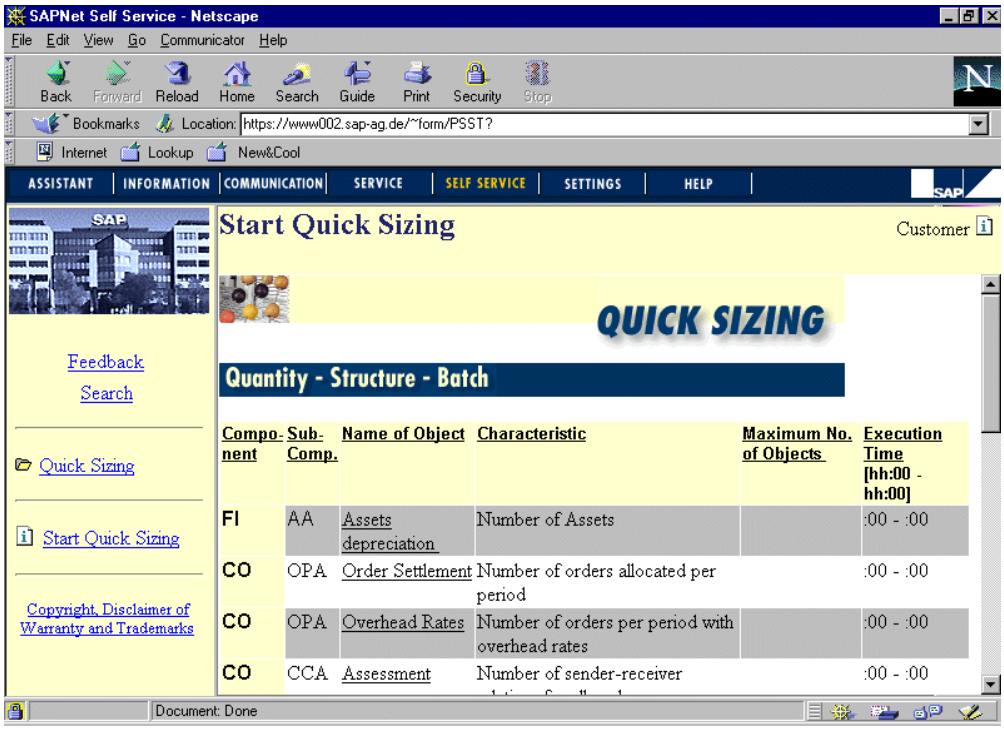


Figure 87. Start Quick Sizing (Quantity-Structure-Batch)

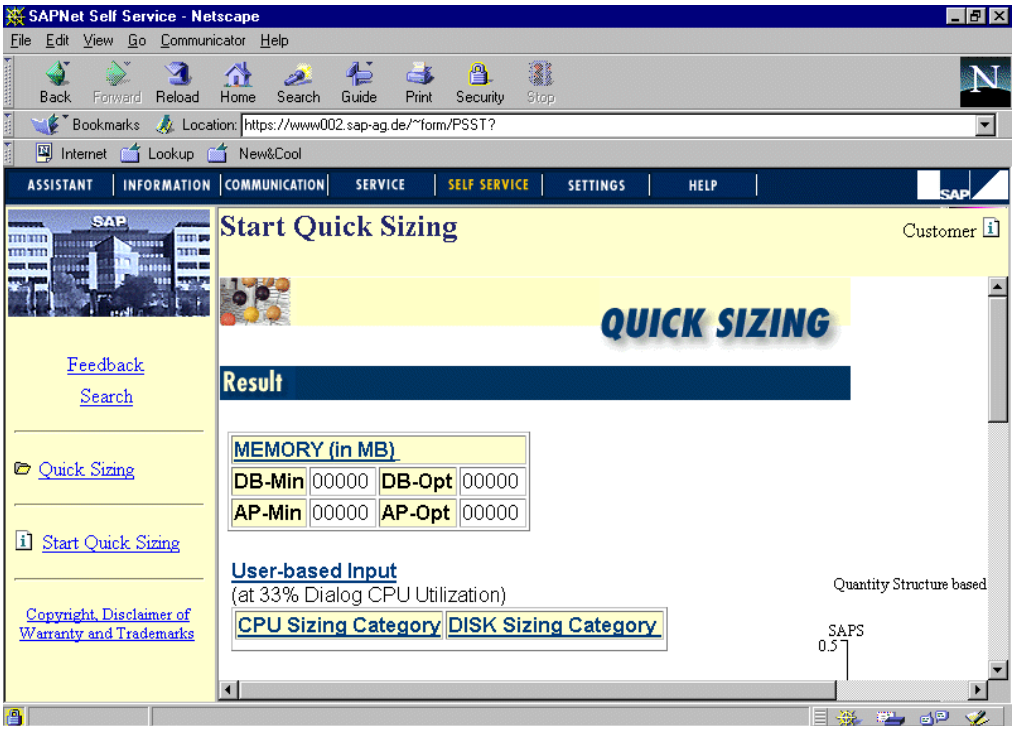


Figure 88. Quick Sizer Result

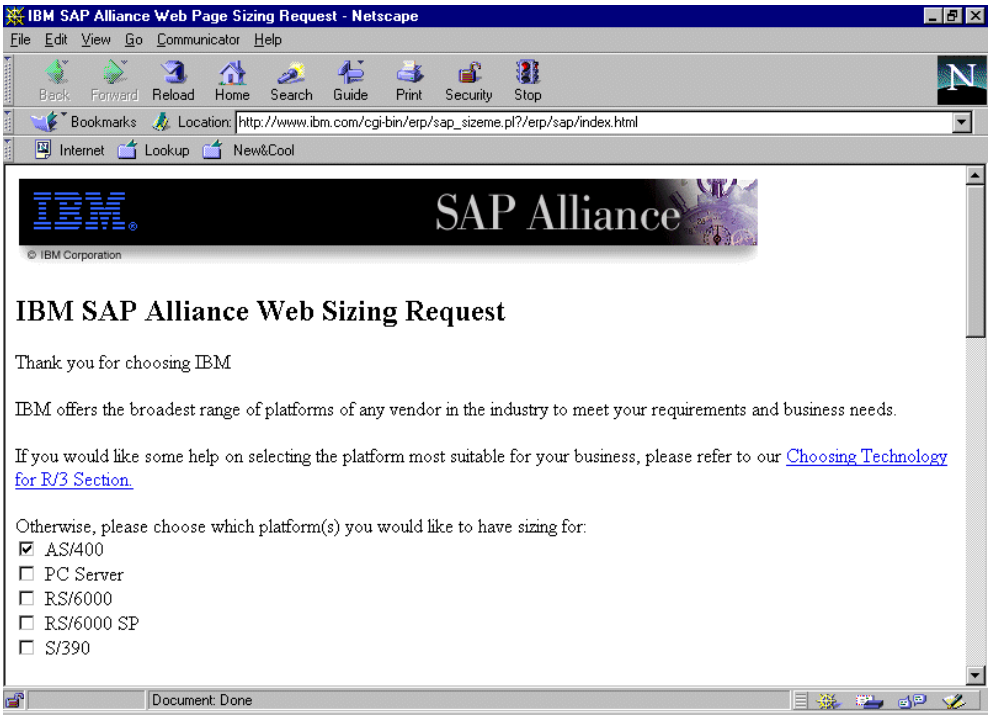

IBM SAP Alliance Web Page Sizing Request - Netscape
File Edit View Go Communicator Help
Back Forward Reload Home Search Guide Print Security Stop
Bookmarks Location: http://www.ibm.com/cgi-bin/erp/sap_sizeme.pl?/erp/sap/index.html
Internet Lookup New&Cool
IBM
SAP Alliance
© IBM Corporation
IBM SAP Alliance Web Sizing Request
Thank you for choosing IBM
IBM offers the broadest range of platforms of any vendor in the industry to meet your requirements and business needs.
If you would like some help on selecting the platform most suitable for your business, please refer to our Choosing Technology for R/3 Section.
Otherwise, please choose which platform(s) you would like to have sizing for:
AS/400
PC Server
RS/6000
RS/6000 SP
S/390
Document: Done

Figure 89. IBM SAP Alliance Web Sizing Request

5.4 Installation Planning of Database for the SAP R/3 System

This section is divided into three subsections on the basis of the database being used (for example, DB2, Oracle and MS SQL Server).

5.4.1 DB2 Database Server Installation Planning

5.4.1.1 Distribution

1. Distribute database files(<DRIVE>:\db2\<SAPSID>\sapdata<N>) and archive log files(<DRIVE>:\db2\<SAPSID>\SQLOGDIR) to different disks.
2. The archive log files should be located on the disk with low I/O. Avoid, for example, accommodating the logs on the same disk as the operating system's paging files or on disks with transaction data.

> **Note**
>
> For performance and security reasons, archived log files and active log files must reside on separate physical disks. As DB2 writes the log records of a transaction synchronously to disk as soon as the transaction has been committed. Therefore, you should use the fastest disk of your system for database logging.

5.4.1.2 Distribution of SAP Software using RAID

For safety and performance reasons it is essential that a minimum of three logical disk volumes are used to separate the active database log files, archived log files and database files.

The active database log files(\db2\<SAPSID>\SQLOGDIR) must reside on a logical volume using RAID 1(Disk Mirroring). They must be separated from the archived log files(\db2\<SAPSID>\log_archive) which can optionally reside on a RAID 1 disk volume. The mirroring is recommended because of safety for production systems.

The data files(\db2\<SAPSID>\sapdata1 ... \db2\<SAPSID>\sapdata<N>) should be located on a logical disk volume using RAID 5(distributed parity checking).

5.4.1.3 Distributing SAP using Separate Disks

For safety reasons always distribute the following directories to separate physical disks:

- The database log files(\db2\<SAPSID>\SQLOGDIR)
- The mirrored database log files(by NT disk mirroring)
- The archived log files(\db2\<SAPSID>\log_archive)
- All DB2 common server data file directories (sapdata1 - sapdata<N>)

> **Note**
>
> To distribute the directories in this way, you need a minimum of five disks. The remaining directories can be distributed to any of these five disks.

5.4.1.4 Data Integrity Requirements

As data integrity is important in any database management system, hence it is recommended that the file system containing the log files (\db2\<SAPSID>\SQLOGDIR) should be mirrored.

> **Note**
>
> A production system must run in **log retain mode**. If a test system is not running in log retain mode, all data which has been written since the last complete backup will be lost after a system crash.

5.4.1.5 Recommended Disk Configuration

This section covers the recommended configuration based on performance.

For example:

Disk1: \db2\<SAPSID>\SQLOGDIR
    \USR\SAP\TRANS
Disk2: \db2\<SAPSID>\sapreorg
    \db2\<SAPSID>\log_archive
Disk3: mirrored database log files (mirror of Disk1)
Disk4: \USR\SAP
    \db2<SAPSID>
Disk5: \db2\<SAPSID>\sapdata1
Disk6: \db2\<SAPSID>\sapdata2
Disk7: \db2\<SAPSID>\sapdata3
Disk8: \db2\<SAPSID>\sapdata4
Disk9: \db2\<SAPSID>\sapdata5
Disk10:\db2\<SAPSID>\sapdata6

5.4.1.6 Minimal Disk Configuration

This configuration should only be used for test or demo systems.

```
Disk1: \db2\<SAPSID>\SQLOGDIR
       \USR\SAP
Disk2: \db2\<SAPSID>\sapdata1
       \db2\<SAPSID>\sapdata2
       \db2\<SAPSID>\sapdata3
Disk3: \db2\<SAPSID>
       \db2\<SAPSID>\sapreorg
       \db2\<SAPSID>\log_archive
       \db2\<SAPSID>\sapdata4
       \db2\<SAPSID>\sapdata5
       \db2\<SAPSID>\sapdata6
```

This *minimal configuration* satisfies the SAP security requirements but has the following disadvantages:

- It doesn't ensure that both database files and log files will not be lost in a single disk failure.
- The minimal configuration ensures that no data will be lost, but recovery will be complicated and time consuming.

5.4.2 Oracle Database Installation Planning

5.4.2.1 Distribution of SAP Software using RAID

It is recommended that a minimum of three logical disk volumes are used to separate the online redo logs, offline redo logs and database files because of safety and performance issues.

The online redo logs(\ORACLE\<SAPSID>\origlogA and \ORACLE\<SAPSID>\origlogB) and the offline redo logs (\ORACLE\<SAPSID>\saparch) must reside on different logical disk volumes using RAID 1(Disk Mirroring).

In SAP systems with a very high data throughput, the directories origlogA and origlogB should reside on different disks for performance reasons. In that case, you would need four logical disks.

The data files (\ORACLE\<SAPSID>\sapdata1 ... \ORACLE\<SAPSID>\sapdata5) should be located on a logical disk volume using RAID 5(distributed parity checking).

5.4.2.2 Distributing the SAP Software Using Separate Disks

For safety reasons, always distribute the following directories to separate physical disks:

1. The database log files:

   ```
   \ORACLE\<SAPSID>\origlogA
        \ORACLE\<SAPSID>\origlogB
   ```

2. The mirrored database log files:

   ```
   \ORACLE\<SAPSID>\mirrlogA
        \ORACLE\<SAPSID>\mirrlogB
   ```

3. The archived database log files:

   ```
   \ORACLE\<SAPSID>\saparch
   ```

4. All Oracle data file directories:

   ```
   sapdata1  -  sapdata<N>
   ```

To distribute the directories in this way, you need at least four disks. The remaining directories can be distributed to any of these four disks:

```
\USR\SAP
     \USR\SAP\TRANS
     \ORANT
     \ORACLE\<SAPSID>\sapreorg
     \ORACLE\<SAPSID>\saptrace
     \ORACLE\<SAPSID>\sapbackup
     \ORACLE\<SAPSID>\sapcheck
```

On Netfinity SAP systems with a high data throughput we recommend that you distribute the following log directories in different disks for better performance:

```
\ORACLE\<SAPSID>\origlogA
     \ORACLE\<SAPSID>\mirrlogA
     \ORACLE\<SAPSID>\origlogB
     \ORACLE\<SAPSID>\mirrlogB
```

> **Note:**
>
> A production Netfinity system running SAP must run in ARCHIVELOG mode.

5.4.2.3 Oracle Control Files

The following Oracle control files should be stored on separate disks:

```
\ORACLE\<SAPSID>\origlogA\ctrl<SAPSID>.ctl
\ORACLE\<SAPSID>\saparch\ctrl<SAPSID>.ctl
\ORACLE\<SAPSID>\sapdata1\ctrl<SAPSID>.ctl
```

5.4.2.4 Recommended Disk Configurations

The following is an example of a recommended disk configuration:

```
Disk1:  \ORACLE\<SAPSID>\origlogA
        \USR\SAP\TRANS
Disk2:  \ORACLE\<SAPSID>\origlogB
        \ORACLE\<SAPSID>\sapreorg
Disk3:  \ORACLE\<SAPSID>\mirrlogA
        \ORACLE\<SAPSID>\saptrace
        \ORACLE\<SAPSID>\sapbackup
Disk4:  \ORACLE\<SAPSID>\mirrlogB
        \ORACLE\<SAPSID>\sapcheck
        \USR\SAP
Disk5:  \ORACLE\<SAPSID>\sapdata1
Disk6:  \ORACLE\<SAPSID>\sapdata2
Disk7:  \ORACLE\<SAPSID>\sapdata3
Disk8:  \ORACLE\<SAPSID>\sapdata4
Disk9:  \ORACLE\<SAPSID>\sapdata5
Disk10: \ORACLE\<SAPSID>\sapdata6
Disk11: \ORACLE\<SAPSID>\saparch
```

5.4.2.5 Minimal Disk Configuration

This configuration should be used only for test or demo systems.

```
Disk1:  \ORACLE\<SAPSID>\saparch
Disk2:  \ORANT
        \ORACLE\<SAPSID>\sapreorg
        \USR\SAP\TRANS
        \ORACLE\<SAPSID>\origlogA
        \ORACLE\<SAPSID>\origlogB
        \ORACLE\<SAPSID>\sapdata1
        \ORACLE\<SAPSID>\sapdata2
        \ORACLE\<SAPSID>\sapdata3
Disk3:  \ORACLE\<SAPSID>\mirrlogA
        \ORACLE\<SAPSID>\mirrlogB
        \ORACLE\<SAPSID>\saptrace
        \ORACLE\<SAPSID>\sapbackup
        \ORACLE\<SAPSID>\sapcheck
        \USR\SAP
        \ORACLE\<SAPSID>\sapdata4
        \ORACLE\<SAPSID>\sapdata5
        \ORACLE\<SAPSID>\sapdata6
```

Appendix E. Special Notices

This publication is intended to help specialists and consultants who are responsible for configuring IBM Netfinity servers and SAP R/3 on Windows NT. The information in this publication is not intended as the specification of any programming interfaces that are provided by IBM or SAP. See the PUBLICATIONS section of the IBM Programming Announcement for Nefinity Servers and SAP R/3 for more information about what publications are considered to be product documentation.

References in this publication to IBM products, programs or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only IBM's product, program, or service may be used. Any functionally equivalent program that does not infringe any of IBM's intellectual property rights may be used instead of the IBM product, program or service.

Information in this book was developed in conjunction with use of the equipment specified, and is limited in application to those specific hardware and software products and levels.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to the IBM Director of Licensing, IBM Corporation, 500 Columbus Avenue, Thornwood, NY 10594 USA.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact IBM Corporation, Dept. 600A, Mail Drop 1329, Somers, NY 10589 USA.

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The information contained in this document has not been submitted to any formal IBM test and is distributed AS IS. The information about non-IBM ("vendor") products in this manual has been supplied by the vendor and IBM assumes no responsibility for its accuracy or completeness. The use of this information or the implementation of any of these techniques is a customer responsibility and depends on the customer's ability to evaluate and integrate them into the customer's operational environment. While each item may have been reviewed by IBM for accuracy in a specific situation, there is no guarantee that the same or similar results will be obtained elsewhere. Customers attempting to adapt these techniques to their own environments do so at their own risk.

Any pointers in this publication to external Web sites are provided for convenience only and do not in any manner serve as an endorsement of these Web sites.

Any performance data contained in this document was determined in a controlled environment, and therefore, the results that may be obtained in other operating environments may vary significantly. Users of this document should verify the applicable data for their specific environment.

© Copyright IBM Corp. 1998

The following document contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples contain the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

Reference to PTF numbers that have not been released through the normal distribution process does not imply general availability. The purpose of including these reference numbers is to alert IBM customers to specific information relative to the implementation of the PTF when it becomes available to each customer according to the normal IBM PTF distribution process.

The following terms are trademarks of the International Business Machines Corporation in the United States and/or other countries:

ADSTAR	Bean Machine
DataPropagator	DataJoiner
DB2	eNetwork
FlowMark	IBM
MQSeries	Net.Data
Netfinity	ServeRaid
VisualAge	VisualWarehouse

The following terms are trademarks of other companies:

C-bus is a trademark of Corollary, Inc.

Java and HotJava are trademarks of Sun Microsystems, Incorporated.

Microsoft, Windows, Windows NT, and the Windows 95 logo are trademarks or registered trademarks of Microsoft Corporation.

PC Direct is a trademark of Ziff Communications Company and is used by IBM Corporation under license.

Pentium, MMX, ProShare, LANDesk, and ActionMedia are trademarks or registered trademarks of Intel Corporation in the U.S. and other countries.

UNIX is a registered trademark in the United States and other countries licensed exclusively through X/Open Company Limited.

Other company, product, and service names may be trademarks or service marks of others.

Appendix F. Related Publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this redbook.

F.1 International Technical Support Organization Publications

For information on ordering these ITSO publications see “How to Get ITSO Redbooks” on page 155.

- *Implementing PC ServeRAID SCSI and SSA RAID Disk Subsystems,* SG24-2098.
- *IBM PC Server Technology and Selection Guide,* SG24-4760
- *Netfinity Server Management,* SG24-5208
- *Netfinity V5.0 Command Line and LMU Support,* SG24-4925
- *Netfinity V5.0 Database Support,* SG24-4808
- *Using ADSM to Back Up Databases,*SG24-4335

F.2 Redbooks on CD-ROMs

Redbooks are also available on CD-ROMs. **Order a subscription** and receive updates 2-4 times a year at significant savings.

CD-ROM Title	Subscription Number	Collection Kit Number
System/390 Redbooks Collection	SBOF-7201	SK2T-2177
Networking and Systems Management Redbooks Collection	SBOF-7370	SK2T-6022
Transaction Processing and Data Management Redbook	SBOF-7240	SK2T-8038
Lotus Redbooks Collection	SBOF-6899	SK2T-8039
Tivoli Redbooks Collection	SBOF-6898	SK2T-8044
AS/400 Redbooks Collection	SBOF-7270	SK2T-2849
RS/6000 Redbooks Collection (HTML, BkMgr)	SBOF-7230	SK2T-8040
RS/6000 Redbooks Collection (PostScript)	SBOF-7205	SK2T-8041
RS/6000 Redbooks Collection (PDF Format)	SBOF-8700	SK2T-8043
Application Development Redbooks Collection	SBOF-7290	SK2T-8037

© Copyright IBM Corp. 1998

How to Get ITSO Redbooks

This section explains how both customers and IBM employees can find out about ITSO redbooks, CD-ROMs, workshops, and residencies. A form for ordering books and CD-ROMs is also provided.

This information was current at the time of publication, but is continually subject to change. The latest information may be found at `http://www.redbooks.ibm.com/`.

How IBM Employees Can Get ITSO Redbooks

Employees may request ITSO deliverables (redbooks, BookManager BOOKs, and CD-ROMs) and information about redbooks, workshops, and residencies in the following ways:

- **Redbooks Web Site on the World Wide Web**

  `http://w3.itso.ibm.com/`

- **PUBORDER** – to order hardcopies in the United States
- **Tools Disks**

  To get LIST3820s of redbooks, type one of the following commands:

  ```
  TOOLCAT REDPRINT
  TOOLS SENDTO EHONE4 TOOLS2 REDPRINT GET SG24xxxx PACKAGE
  TOOLS SENDTO CANVM2 TOOLS REDPRINT GET SG24xxxx PACKAGE (Canadian users only)
  ```

  To get BookManager BOOKs of redbooks, type the following command:

  ```
  TOOLCAT REDBOOKS
  ```

  To get lists of redbooks, type the following command:

  ```
  TOOLS SENDTO USDIST MKTTOOLS MKTTOOLS GET ITSOCAT TXT
  ```

  To register for information on workshops, residencies, and redbooks, type the following command:

  ```
  TOOLS SENDTO WTSCPOK TOOLS ZDISK GET ITSOREGI 1998
  ```

- **REDBOOKS Category on INEWS**
- **Online** – send orders to: USIB6FPL at IBMMAIL or DKIBMBSH at IBMMAIL

Redpieces

For information so current it is still in the process of being written, look at "Redpieces" on the Redbooks Web Site (`http://www.redbooks.ibm.com/redpieces.html`). Redpieces are redbooks in progress; not all redbooks become redpieces, and sometimes just a few chapters will be published this way. The intent is to get the information out much quicker than the formal publishing process allows.

© Copyright IBM Corp. 1998

How Customers Can Get ITSO Redbooks

Customers may request ITSO deliverables (redbooks, BookManager BOOKs, and CD-ROMs) and information about redbooks, workshops, and residencies in the following ways:

- **Online Orders** – send orders to:

	IBMMAIL	**Internet**
In United States	usib6fpl at ibmmail	usib6fpl@ibmmail.com
In Canada	caibmbkz at ibmmail	lmannix@vnet.ibm.com
Outside North America	dkibmbsh at ibmmail	bookshop@dk.ibm.com

- **Telephone Orders**

United States (toll free)	1-800-879-2755
Canada (toll free)	1-800-IBM-4YOU
Outside North America	(long distance charges apply)
(+45) 4810-1320 - Danish	(+45) 4810-1020 - German
(+45) 4810-1420 - Dutch	(+45) 4810-1620 - Italian
(+45) 4810-1540 - English	(+45) 4810-1270 - Norwegian
(+45) 4810-1670 - Finnish	(+45) 4810-1120 - Spanish
(+45) 4810-1220 - French	(+45) 4810-1170 - Swedish

- **Mail Orders** – send orders to:

IBM Publications Publications Customer Support P.O. Box 29570 Raleigh, NC 27626-0570 USA	IBM Publications 144-4th Avenue, S.W. Calgary, Alberta T2P 3N5 Canada	IBM Direct Services Sortemosevej 21 DK-3450 Allerød Denmark

- **Fax** – send orders to:

United States (toll free)	1-800-445-9269
Canada	1-800-267-4455
Outside North America	(+45) 48 14 2207 (long distance charge)

- **1-800-IBM-4FAX (United States)** or **(+1) 408 256 5422 (Outside USA)** – ask for:

  Index # 4421 Abstracts of new redbooks
  Index # 4422 IBM redbooks
  Index # 4420 Redbooks for last six months

- **On the World Wide Web**

Redbooks Web Site	http://www.redbooks.ibm.com
IBM Direct Publications Catalog	http://www.elink.ibmlink.ibm.com/pbl/pbl

Redpieces

For information so current it is still in the process of being written, look at "Redpieces" on the Redbooks Web Site (`http://www.redbooks.ibm.com/redpieces.html`). Redpieces are redbooks in progress; not all redbooks become redpieces, and sometimes just a few chapters will be published this way. The intent is to get the information out much quicker than the formal publishing process allows.

IBM Redbook Order Form

Please send me the following:

Title	Order Number	Quantity

First name | Last name

Company

Address

City | Postal code | Country

Telephone number | Telefax number | VAT number

☐ Invoice to customer number

☐ Credit card number

Credit card expiration date | Card issued to | Signature

We accept American Express, Diners, Eurocard, Master Card, and Visa. Payment by credit card not available in all countries. Signature mandatory for credit card payment.

List of Abbreviations

ADSM	ADSTAR Distributed Storage Manager
ASMA	Advanced System Management Adapter
APC	American Power Conversion
BDC	Backup Domain Controller
BIOS	Basic Input Output System
CCMS	Computing Center Management System
DBMS	Database Management System
DB Server	Database Server
DIMM	Dual-Inline Memory Module
DLL	Dynamic Link Library
DMI	Desktop Management Interface
DRAM	Dynamic Random Access Memory
ESD	Electrostatic Discharge
ECC	Error Correction Code
EISA	Extended Industry Standard Architecture
FDDI	Fiber Distributed Data Interface
FCS	First Customer Shipment
GUI	Graphical User Interface
HCL	Hardware Compatibility List, Microsoft
HTML	Hypertext Markup Language Format
IBM	International Business Machines Corporation
ICSM	IBM Cluster Systems Manager
IDE	Integrated Drive Electronics
ISA	Industry Standard Architecture
I/O	Input/Output
IC	Integrated Circuit
IPC	Interprocess Communication
ITSO	International Technical Support Organization
LAN	Local Area Network
MIB	Management Information Base
MSCS	Microsoft Cluster Server
NMI	Non-Maskable Interrupt
NIC	Network Interface Card
NTFS	Windows NT File System
PCI	Peripheral Component Interconnect
POST	Power-on Self-test
PFA	Predictive Failure Analysis
PDC	Primary Domain Controller
RAID	Redundant Array of Independent Disks
RWC	Remote Workstation Control
SD	Sales and Distribution, SAP R/3 module
SMART	Self-Monitoring Analysis and Reporting Technology
SSA	Serial Storage Architecture
SCF	Service Configuration File, Netfinity Manager
SCA	Single Connector Attach
SNMP	Simple Network Management Protocol
SCSI	Small Computer Systems Interface
SWG	SMART Working Group
SCU	System Configuration Utility
SMP	Symmetric Multiprocessing
SMS	Systems Management Server, Microsoft
UPS	Uninterruptable Power Source
VGA	Video Graphics Array
VPD	Vitual Product Data
WAN	Wide Area Network
WB	Write-Back, IBM ServeRAID Adapter
WT	Write-Through, IBM ServeRAID Adapter
ZIF	Zero Insertion Force

© Copyright IBM Corp. 1998

Index

Numerics
7133 15
90-day startup support 6

A
abbreviations 159
acronyms 159
ADSTAR Distributed Storage Manager (ADSM) 107
Advanced System Management Adapter (ASMA) 6, 51
Alert Manager 123
allocation of server memory 84
American Power Conversion (APC) 12
APC UPS 21
application layer 10
Application Server 133
  installing 103
  managing 114
archived database log files 149
archiving 111, 114
array, creating 64
ASMA Card 85
ASMA COM ports 53

B
battery-backup cache 65
BIOS and firmware level 47
BIOS updates 17, 47
boot order 37
boot.ini 74

C
Call Home remote support 7
Capacity Manager 124
CCMS in SAP R/3 Release 4.0 113
Central Instance, installing 96
centralized installation 133
certified Netfinity Server configurations 137
changing defaults 99
client installation 115
client/server R/3 architecture 10
clustering 14
Computing Centre Management System (CCMS) 113
creating array and logical drive 64
Critical File Monitor 124

D
data solutions using ADSM 109
database layer 10
database log files 149
Database Servers, managing 114
DataJoiner 109
DataPropagator Relational 106
DB2 Database Server installation planning 147
defaults, changing 99
Differential Solution 3
disk space for SAP R/3 2
distributed installation 133
distributing the SAP software using separate disks 149
DMI Browser 124
Domain Controller 133
Domino 108
drivers 17
Duralink Failover 40

E
ECC Memory Setup 125
emergency boot disk 75
eNetwork Communications Suite 108
eNetwork Host On-Demand 108
ESCON Channel 39
Event Scheduler 125
EXP10 15, 42
external hard drives 42
external SCSI enclosures 3

F
failover solution 14
Fast Ethernet switch 39
firmware level 47
firmware update 49
Flowmark 109

G
graphic adapters 46

H
hard drives, external 42
hard drives, internal 41
heartbeat processing 117
high availability 7, 12
  and SAP R/3 13
  on the operating system 13
hot spare considerations 58

I
IBM Cluster Systems Manager (ICSM) 15
IBM SAP Competency Centers 6
installation planning, R/3 141
installing adapter cards 35
internal hard drives 41
Internet enabling layer 10
IPSMON 86
IPSSEND 86
iXOS SAP R/3 NT 137

J
jumper settings 33

© Copyright IBM Corp. 1998

L
logical drive, creating 64
Lotus Domino 108
Lotus Notes 108

M
Management Information Base (MIB) 13
managing R/3 Application Servers and Database Servers 114
memory 33
memory configuration rules 34
memory size, minimum main 33
MetaStor 15
Microsoft Cluster Server (MSCS) 14
Microsoft Hardware Compatibility List (HCL) 15
minimal disk configuration 148
mirrored database log files 149
MQSeries 106
multiple instances 114
multiple RAID or network adapters 37
multiple ServeRAID controller 38
multi-region support 117

N
Net.Commerce 107
Net.Data 106
Netfinity 7000 1
Netfinity Extension PowerXtend 28
Netfinity Manager 6, 118
  functions 121
network interfaces 39
ntscmgr 25

O
online documentation 26
Oracle control files 150
Oracle data file directories 149
Oracle database, creating 99
Oracle, database installation planning 149
Oracle, installing 93

P
PAGEFILE.SYS 82
PCI to EISA bridge 36
performance recommendations 36
Power-On Error Detect 125
PowerXtend 28
Predictive Failure Analysis 6, 125
preparing the disk space 79
presentation layer 11
Process Manager 126
processor cache sizes in SMP environments 29
processor upgrades, Netfinity 7000 29

Q
Quick Sizer 141

R
R/3 Application Servers, managing 114
R3INST 92
RAID Cluster Adapter 4
RAID Manager 126
RAID PCI Adapter 4
RDISK command 87
read ahead option 62
Ready-to-Run R/3 139
recommended disk configuration 148
Redundant Network Interface Card 40
Remote Session 126
Remote System Manager 126
Remote Workstation Control 128
RRR (Ready to Run R/3) 139

S
SAP architecture 9
SAP R/3 Base System installation 89
SAP R/3 certification 137
SAP R/3 post-installation 104
SAP R/3 sizing and installation planning 141
SAP software, distributing using different disks 149
SAP users, defining 90
sapdba 25
SAPGUI 11
sapntwaitforhalt 25
sapsrvkill 25
sapstart 25
Screen View 128
SCSI and RAID technology 2
SCSI controller and subsystems 2
SCSI external enclosures 3
SCSI Fast/Wide Ultra Transfer Mode 60
SCSI solutions for SAP R/3 2
SCSI standards 2
SCSI-2 Fast/Wide 2
SCSI-2 Ultra Fast/Wide 2
Security Manager 128
Serial Connection Control 129
Serial Storage Architecture (SSA)
  controller and subsystems 3
  RAID Cluster Adapter 4
  RAID PCI Adapter 4
Serial Storage Architecture (SSA) solutions for SAP R/3 5
server configurations 137
server memory allocation 84
ServeRAID Adapter connections 134
ServeRAID Administration and Monitoring Utility 75
ServeRAID BIOS and firmware update 49
ServeRAID configuration backup 66
ServeRAID controller, multiple 38
ServerProven solutions 5
Service Configuration Manager 129
Service Processor Manager 129
shut down an application server 26
shut down the central instance 26
shut down the database 26
Simple Network Management Protocol (SNMP) 13

sizing, SAP R/3 141
Software Inventory 130
stop an application server service 26
Stripe Unit Size 62
synchronization for RAID level 5 logical drives 78
System Configuration Utility (SCU) 51, 53
System Diagnostics Manager 130
System Information Tool 130
System Monitor 130
System Partition Access 131
System Profile 131
SystemXtra 6

T

TCP/IP Auto-Discover 127
Third Channel Cable 44
three-tier hardware configuration 11
Tivoli TME 10 108
TME 10 Enterprise Console (TEC) 116
TME 10 Module for R/3 114
two-tier configuration 11

U

UDB DB2 106
Ultra Fast/Wide 2
Uninterruptible Power Source (UPS) 12, 18
updates 17

V

video subsystem 45
Vinca High Availability 14
Vinca StandbyServer 14
virtual memory 82
Visual Warehouse 106
VisualAge 107

W

Web Manager 131
work processes 10

ITSO Redbook Evaluation

Optimizing IBM Netfinity Servers for SAP R/3 and Windows NT
SG24-5219-00

Your feedback is very important to help us maintain the quality of ITSO redbooks. **Please complete this questionnaire and return it using one of the following methods:**

- Use the online evaluation form found at http://www.redbooks.ibm.com
- Fax this form to: USA International Access Code + 1 914 432 8264
- Send your comments in an Internet note to redbook@us.ibm.com

Which of the following best describes you?
_ **Customer** _ **Business Partner** _ **Solution Developer** _ **IBM employee**
_ **None of the above**

Please rate your overall satisfaction with this book using the scale:
(1 = very good, 2 = good, 3 = average, 4 = poor, 5 = very poor)

Overall Satisfaction _____

Please answer the following questions:

Was this redbook published in time for your needs? Yes___ No___

If no, please explain:

_____

_____

_____

_____

What other redbooks would you like to see published?

_____

_____

_____

Comments/Suggestions: (THANK YOU FOR YOUR FEEDBACK!)

_____

_____

_____

_____

_____

© Copyright IBM Corp. 1998

SG24-5219-00

Printed in the U.S.A.

Optimizing IBM Netfinity Servers for SAP R/3 and Windows NT

SG24-5219-00